6.0 STANDARD OPERATING PROCEDURES

The purpose of this section is to provide practical operating procedures for the proper operation of the various systems. This section also recommends settings for facility hand valves, provides tables of standard operating procedures, describes the fail-safe control mechanisms of the system, and provides an overview of the facility control system.

6.1 RECOMMENDED SETTINGS

For convenience, all hand valves, as well as all other valves and monitoring instruments, have a unique identification code (e.g., HV 20-1) consisting of a two- or three-letter device identification code (i.e., HV for hand valve), followed by a two-digit system code (i.e., 20 for the influent system), followed by a sequence number for designation between similar elements within a system (i.e., 1 for the first hand valve in system 20). All coded components in the facility have engraved tags indicating their identification codes. System codes are summarized in Table 6-1. The recommended normal operating position of hand valves contained in the more frequently operated systems are summarized in Tables 6-2 to 6-7. Device identification codes, process equipment and valve symbols, and instrumentation legends are described on Drawing K-1 of the plans for construction.

The facility control systems in YIC 1 at the main control panel contain numerous preset, but operator adjustable, control and monitoring parameters. Many of these parameters are adjustable from the OIT screens within a limited range of values. Table 6-8 lists both the recommended value and the allowed range of values for these parameters.

Table 6-8 also identifies the OIT screen that the parameter is accessed from and the security level code required for adjustment of each control parameter. Three levels of system access protection exist, each requiring a different password for access. The first level code allows access to the system to scroll through a series of system operation screens. The second level code allows access to edit a limited number of control parameters. Finally, a third level code allows access to edit all adjustable parameters. Passwords are required to access system levels two and three; the passwords should be carefully controlled to ensure that only personnel with appropriate qualifications, level of experience, and understanding of the consequences of altering parameter values can enter the different system levels. Selection of inappropriate parameter values, either singly or by altering multiple related parameters, even within the allowed ranges, have the potential

to upset system operation, possibly resulting in equipment or facility damage. The range of values that the system will accept is limited.

6.2 STANDARD OPERATING PROCEDURES

Standard operating procedures (SOPs) for the facilities are described in Tables 6-10 through 6-38, as summarized in Table 6-9. Piping and instrumentation diagrams for each applicable system are referred to in the SOPs to aid the operator in understanding the location of the equipment involved. Drawing K-1 of the plans for construction presents the device identification codes, process equipment and valve symbols, and instrumentation legends for use in interpreting these diagrams. Each SOP contains the step procedures necessary to perform a specific operation on a specific system. At a minimum, the following procedures are detailed for each system described in this section: pre-start and safety check, startup, routine operation, abnormal operation, and shutdown procedures.

Execution of the step procedures for any activity will likely involve a combination of manual operation of hand valves and equipment and computer-directed operations implemented through the control system at the main control panel. However, nearly all automated equipment are equipped with hand-off-automatic controls that allow local manual operation. Detailed instructions for use of the computer control system at the main control panel can be found in the control system user's manual.

6.3 FAIL-SAFE PROCEDURES

The various systems contain numerous fail-safe control mechanisms to prevent damage to the systems' components in the event of extreme conditions or conditions nearing design criteria. A large number of these mechanisms can be adjusted by the system operator (see Table 6-8). The fail-safe control mechanisms are briefly summarized below. They are implicitly identified in Section 6.4, which describes the instrumentation and control systems, and also in the instrumentation and control user's manual.

- Interconnection of control system for vital system components (groundwater extraction system, air stripping treatment system, security system for treatment facility and well vaults, and safety system including sensored safety showers) with automatic telephone dialing system to immediately alert appropriate facility oversight personnel to problems

- Interconnection of air stripping system fan status, vibration, temperature, air flow, pressure, etc. with fan and overall system controls to automatically initiate shut down of the groundwater extraction and treatment equipment in the event of alarm conditions during operation or startup

- Interconnection of air stripping treatment system and groundwater extraction system via radio frequency modem to coordinate treatment and automatically initiate system shut down in the event of problems

- Interconnection of air stripping treatment system with groundwater extraction system to maintain treatment parameters (i.e., air to water ratio) at present values despite varying groundwater flow rates

- Interconnection of groundwater extraction pump controls with water flow rate or groundwater drawdown depths to maintain optimal remedial operations

- Interconnection of well vault security controls with main control panel to detect unauthorized access

- Interconnection of level sensors in tanks, sumps, and the air stripping tower clear well with valves, pumps, and flow control systems to prevent overfills

- Interconnection of piping pressure and flow meters with pumps and flow control valves to prevent excess pressures and flow and automatically initiate system shut down in the event of problem

- Inclusion of automatic self-regulating heat cable system on certain exterior piping to prevent freeze damage in the event of low ambient temperatures

- Interconnection of temperature sensors and valves to automatically drain certain exterior above-grade piping to prevent freeze damage in the event of low air stripping tower clear well temperatures

- Inclusion of automatic air/vacuum release valves in the groundwater conveyance pipeline

- Inclusion of automatic pressure relief valves in all systems to prevent damage to piping, valves, or pumps in the event of overpressures

- Interconnection of interior building drain sump with building ventilation system to prevent elevated concentrations of chemical vapors in the treatment facility building

- Interconnection of the control system for the groundwater extraction system and air stripping treatment system with the scale control chemical injection system to automatically initiate shut down of all systems if the scale control chemical level in tank T-1 falls below a minimum level, of if scale control chemical feed pumps are disabled

- Interconnection of the control system for the groundwater extraction system and air stripping treatment system with the pH measurement system on the air stripping tower discharge line to automatically initiate shut down of all systems if the pH is outside allowable limits

- Interconnection of the control system for influent line automatic valves with the controls for batch cleaning to automatically isolate influent lines from batch cleaning solutions.

6.4 SUMMARY OF CONTROLS

This section describes in general terms the instrumentation and controls for the groundwater extraction wells, the treatment facility, radio telemetry system, and the automatic telephone dialing alarm system. For detailed information about specific equipment, instruments, and control hardware and software, refer to the manufacturers' literature in the supplemental operations and maintenance manuals.

6.4.1 WELLHEAD INSTRUMENTATION AND CONTROLS

Automatic operation and monitoring of the wellhead equipment (Systems 101 - 111) is accomplished using programmable logic controllers (YICs) installed at the wellhead pump control panels (PCPs). All wells utilize the same control strategy. The discussion presented below is for System 101 at well CP-S1 and it is exemplary of all well systems.

Submersible well pumps are used to pump the groundwater from each well and convey it to the treatment facility through a series of interconnecting pipelines. The quantity of groundwater pumped from each well is monitored by a magnetic flow meter (e.g., FE 101-1). Flow rate (e.g., FIT 101-1) and total accumulated flow (e.g., FQI 101-1) are indicated locally and transmitted to YIC 101. These flow measurements are transmitted by YIC 101 via a radio telemetry system to YIC 1 located at the treatment plant and indicated on the operator interface terminal (OIT) at the main control panel (MCP) on the "Well S-1" screen as FI 101-2 and FQI 101-2, respectively. The water level in the well is monitored and transmitted to a local indicator mounted on the front panel of the PCP and to YIC 101. YIC 101 then transmits to YIC 1 by a radio telemetry system (see Section 6.4.3), which allows the OIT on the well S-1 screen to be indicated as LI 101-2.

The submersible well pump is controlled by a manual-automatic switch, HS 101-1, which is located at the variable frequency drive (VFD) keypad. With this switch in manual mode (control panel), the pump operates continuously from the keypad controls on the VFD panel without regard to automatic interlock controls. In automatic mode, the pump is controlled by YIC 101 based on

either a flow or level control strategy. Pump operation is indicated at the PCP by a green operating light, OL 101-1, and is indicated at treatment plant MCP on the system overview screen as a green "on" light at well S-1 (OL 101-3). Power on is indicated by illumination of an amber light at the PCP as OL 101-2. Motor overload or system failure is indicated at the PCP by illumination of a red alarm light, OA 101-1, and is a red tail light at the MCP on the "system overview" screen. Pump running time is indicated in total cumulative hours at running time meter, KQI 101-1.

YIC 101 controls pump discharge by modulating the input signal to the VFD, which varies the speed of the pump to achieve a preset level of water in well or a preset constant flow. Pump speed is transmitted from the VFD to YIC 101, which in turn transmits to YIC 1 located at the treatment plant. Pump discharge pressure is monitored by PIT 101-1, which sends a signal to YIC 101. Set points for low or high pressure conditions are established at YIC 101 and are interlocked with operation of pump. YIC 101 stops the pump after a preset, but operator adjustable time period, if the pressure is below the low pressure set point or above the high pressure set point. Low and high pressure failure signals are indicated at the PCP by PAL 101-1 and PAH 101-1, respectively. If the pump system fails for high or low pressure, motor overload, or low water level in well, respective alarm lights shall remain illuminated until failure is cleared by pressing the reset switch, HMS 101-1; activation of any of these system failures shall cause YIC 101, through the telemetry system, to activate the general operation alarm, OA 101-2, at the treatment plant MCP for the groundwater extraction well. If a pump operation is interrupted due to power failure, the well pump shall remain off until restarted from the MCP.

The following describes the normal sequence of operation. Assume pump P 101-1 is initially off and HS 101-1 is in auto position, and liquid level in well is above pump stop level. When HS 101, located at the MCP (OIT) at screen 39, located from the level 1 wells screen, is placed into start position, the pump starts at the operator adjustable but preset minimum speed. After a preset time period (adjustable at YIC), and if the discharge pressure is above the low pressure set point (i.e., located at screen 5, well settings) as sensed by PIT 101-1, then YIC 101 signals the VFD to increase the speed of the pump at a preset but operator adjustable rate until liquid level in well reaches preset but operator adjustable level as monitored by LIT 101-1. A proportional integral differential (PID) control strategy is used to adjust the rate and degree speed changes. The level signal is transmitted to the treatment plant and level indicated at MCP as LI 101-2. Levels are indicated as feet above the top of the respective pump. YIC 101 modulates the pump speed to maintain a constant water level in the well according to the set point defined on OIT screen 5. If the

liquid level in well falls below level set point, YIC 101 gradually decreases the speed of the pump at a preset but operator adjustable rate until the liquid level in well reaches the set point liquid level. Additionally, if the level in the well continues to fall, triggering LSL 101-1, YIC 101 energizes the low-level alarm light, LAL 101-1, stops the pump after an operator adjustable but preset time period, and causes YIC 1 to activate red fail light OA 101-2 at the MCP on the system overview screen and a low water level light on well screen 9 at MCP (OIT). An audible alarm is also initiated for the condition. If the alarm is not acknowledged within a preset time period, then YIC 1 will trigger the ADAS to commence alarm notification by telephone.

The groundwater extraction pump process control system features another mode of automatic control based on maintaining a constant groundwater flow rate. Selection of the level or flow mode for automatic control is made through a selector switch located at the PCP. The target flow rate is established at YIC 101 through YIC 1 at the level 1 settings available from the respective well screen. The set point flow rate is operator adjustable. Selection of the mode of operation (i.e., flow or level) and target flow or water level set points is displayed on the well screen. When a groundwater extraction pump is operated in the flow control mode, YIC 101 modulates the speed of the pump through the VFD to maintain constant flow based on the signal received from the in-line groundwater flow meter at the wellhead.

YIC 101 monitors the proper functioning of the variable frequency drive. Specifically, YIC 101 monitors a relay contact (YS 101-2) at the VFD for P 101, which indicates when the VFD is at speed. If YS 101-2 is not triggered within an operator adjustable but preset time period established at YIC 101, YIC 101 activates operation alarms OA 101-1 at the PCP and OA 101-2 at the MCP. YIC 101 also monitors a second relay contact YS 101-3 at the VFD, which signals YIC 101 in the event of a VFD alarm condition. If YS 101-3 is triggered, YIC 101 stops P 101 and activates operation alarms OA 101-1 at the PCP and OA 101-2 at the MCP.

Access doors to the well vault are continuously monitored by YIC 101 to detect both authorized and unauthorized access. A limit switch located on the primary access door to the vault signals YIC 101 whenever the access door is opened. If the opening of the doors is authorized, then a red intruder alarm light is indicated on the respective well screen at the MCP. If the entry is unauthorized, YIC 101 shall stop the pump and signal YIC 1 to activate audible and visual alarms. If the alarm is not acknowledged at the MCP within an operator adjustable but preset time period, YIC 1 triggers the ADAS located at the MCP. The operator interface at the MCP on level 2 of the respective well screen allows the operator to disable the wellhead intruder alarm detection system.

Disabling of the wellhead intruder alarm detection system requires a password and must be implemented on a well-by-well basis.

The floor sump in the well vault is continuously monitored for accumulation of water by a magnetic reed float switch, LSH 101-1. If water accumulates in the vault sump above the set point level, LSH 101-1 signals YIC 101 by a switch contact closure. In turn, YIC 101 activates the high water alarm light LAH 101-1 at the PCP. YIC 101 then stops the pump and signals the MCP of the alarm condition by causing a red fail light OA 101 to be energized on the system overview screen and a red light, LAH 101-2, labeled high sump level to be energized at the MCP at the respective well screen.

6.4.2 TREATMENT FACILITY INSTRUMENTATION AND CONTROLS

This section describes the instrumentation and controls systems for facility systems 20 to 29. Refer to Table 6-1 for identification of these systems. Also, the reader's understanding of the system descriptions will be enhanced if the facility piping and instrumentation drawings are concurrently reviewed.

6.4.2.1 System 20 - Groundwater Influent to Treatment Facility

Groundwater flow to the treatment facility from the conveyance system is monitored by magnetic-type flow meters, FE 20-1, FE 20-2, and FE 20-3, which transmit a flow proportional signal to the programmable logic controller (YIC 1) at MCP. Flow rate (FI) and accumulated total accumulated flow (FQI) are indicated locally and also displayed on the OIT screen 24, influent system. YIC 1 compares the flow rate measured by each flow meter at the treatment facility with the sum of the respective individual flow rates measured by the wellhead flow meters. YIC 1 determines if there is a significant difference in the pumped and received flow rate by comparison to an operator adjustable but preset value. If the difference in the flow rates exceeds the operator adjustable but preset value (e.g., 5 percent), then YIC 1 will shut down those wells conveying water into the pipeline in question and activates flow failure alarms for the affected wells at the MCP. If the alarm condition is not acknowledged within an operator adjustable but preset time period, YIC 1 signals the ADAS of the respective well(s) failure.

YIC 1 sums the flow rates for FE 20-1, FE 20-2, and FE 20-3 and subtracts any measured flow by FE 21-1 to compute the flow conveyed to the air stripping tower. Flow and accumulated flow

conveyed to the tower are indicated at the MCP as plant flow (FI 20-4) and totalized flow (FQI 20-4) on OIT screen 24, "Influent System."

A flow control valve, FCV 20-1, is provided on influent pipeline to regulate the flow of groundwater to the air stripper and to prevent flooding of air stripping tower clear well. Operation of FCV 20-1 is controlled through YIC 1, which modulates the position of FCV 20-1 to maintain adequate free board in the air stripper clear well. The position of FCV 20-1 is indicated at the MCP on OIT screen 24,"Influent System", as ZI 20-1. If the level in the clear well rises above the operator adjustable but preset level established at YIC 1 (OIT screen 25, "Influent Settings"), YIC 1 sends a signal to flow control valve positioner ZC 20-1 to close the valve at an operator adjustable but preset rate until the flow rate is within a defined normal operating range. Position switches on flow control valve signal YIC 1 when the valve is fully open (ZSH 20-1) and fully closed (ZSL 20-1). Liquid level with air stripper clear well is monitored by LE/LT 24-1 and displayed. Pressure upstream of FCV 20-1 is locally indicated and monitored by PIT 20-1, and indicated at the MCP on OIT screen 24, influent system. If the pressure in influent pipeline increases above an operator adjustable but preset value established at YIC 1 OIT screen 25, "Influent Settings" (pipe max press), YIC 1 activates audible and visual alarm, PAH 20-1. If the alarm condition exists after an operator adjustable but preset time delay set on OIT screen 25, "Influent Settings" (over press shutdn), YIC 1 initiates shutdown of the groundwater extraction system and air stripping treatment system, and activates the ADAS.

6.4.2.2 System 21 - Groundwater Bypass System

Operation of the bypass system is governed by the consent decree. DO NOT OPERATE WITHOUT REGULATORY APPROVAL. A bypass pipeline is provided to allow groundwater not requiring treatment to be diverted through the treatment facility and discharged directly into the air stripping tower clear well. Flow through the bypass line is manually controlled and flow rate, if any, is monitored by magnetic flow meter, FE 21-1. A flow proportional signal is transmitted from flow meter transmitter FT 21-1 to YIC 1. Flow rate and accumulated total flow are indicated locally and at MCP as FI 21-1 and FQI 21-1, respectively. Operational graphics for the bypass system are indicated on OIT screen 26. All flow of groundwater bypassing the air stripping tower is recorded by the data logger.

Level control valve LCV 21-1 is provided on bypass pipeline to prevent flooding of air stripping tower clear well. Operation of LCV 21-1 is controlled by YIC 1, which modulates the

position of LCV 21-1 to maintain the liquid level in the clear well as measured by LE 24-1 within a preset but operator adjustable range; the system works in a manner similar to that descried for FCV 20-1. The position of LCV 21-1 is indicated on OIT screen 26, "Bypass System." If the level in the clear well rises above the operator adjustable but preset liquid level YIC 1 signals the level control valve positioner, ZC 21-1, to close the valve at an operator adjustable but preset rate until the liquid level in the clear well is within its defined normal operating range. Position switches on the bypass level control valve signal YIC 1 when the valve is fully open (ZSH 21-1) and fully closed (ZSL 21-1). Pressure upstream of LCV 21-1 is locally indicated and monitored by PIT 21-1. Operating pressure is also indicated on OIT screen 26, "Bypass System." If pressure in bypass pipeline increases above the operator adjustable but preset value established at YIC 1 OIT screen 27, then YIC 1 activates an audible and visual alarm, PAH 21-1. If the alarm condition exists after an operator adjustable but preset time delay, YIC 1 initiates shutdown of the groundwater extraction system and the air stripping treatment system and activates the ADAS.

6.4.2.3 System 22 - Scale Control Chemical Injection System

Scale control chemical is added to the influent water to air stripping treatment systems to inhibit formation of mineral scale composed primarily of calcium carbonate. The scale control chemical injection system consists of a 1,200-gallon scale control chemical storage tank, T-1; duplex metering pumps P 22-1 and P 22-2 for injection of scale control chemical; and scale control chemical transfer drum pump, P 22-3, for bulk transfer of scale control chemical to the storage tank. Status of the scale control system is indicated on OIT screen 28, "Chemical Scale System."

A selector switch, located at MCP on OIT screen 29, "Chemical Scale Settings", controls selection of duty and standby status for scale control chemical injection pumps, P 22-1 and P 22-2. When no duty pump selected, neither pump is operable in the automatic mode. When P 22-1 is selected the duty pump, P 22-2 automatically is assigned as the standby pump in case of failure of the duty pump; similarly, when HS 22-2 is in position 2, P 22-2 is the duty pump with P 22-1 as standby.

An Internal/Off/External selector switch located on the front panel of each scale control chemical injection pump controls the operation of the pump. Operation of each respective scale control chemical feed pump is controlled by HOA switches, HS 22-1 and HS 22-2, respectively, located at the motor starter panel (MSP-1), located in the electrical room. Operating lights and alarm lights are provided for each pump on OIT screen 28, "Chemical Scale System." In hand

position, pump output can be controlled locally at the pump by the stroke frequency and stroke length controls provided with the pump when the selection switch on the pump is set on internal. In auto position, pump output is controlled by YIC 1, which sends a 4-20 mA signal (i.e., proportional to flow rate, as measured by FE 20-4) to the current to frequency converter supplied with each metering pump. The converter sends a pulsed output signal to the pump varying in frequency from 0 to 100 pulses per minute in proportion to input signal.

Flow in the discharge line is monitored by flow switch, PSL 22-1. If the duty pump fails, a drop in pressure in the chemical injection pipeline will occur, triggering low pressure switch PSL 22-1; YIC 1 monitors the switch and activates the pump fail light when PSL 22-1 is triggered, then deactivates the duty pump and starts the standby pump. Operation of the standby pump is similar to that previously described for the duty pump; however, if the standby pump fails after an operator adjustable but preset time delay (i.e., established at OIT screen 29, "Chemical Scale Settings"), YIC 1 initiates shut down of the groundwater extraction system and air stripping treatment system and activates the ADAS.

The level of scale control chemical solution in scale control chemical storage tank T-1 is monitored by level element LE 22-1. Liquid level is indicated locally as percent of tank fullness . Liquid level in tank T-1 is also indicated at the MCP on OIT screen 28, "Chemical Scale System." At an operator adjustable but preset value corresponding to a low liquid level in the tank (LSL 22-1) (i.e., established at OIT screen 29, "Low Tank Level Setpt"), YIC 1 activates level alarm light LAL 22-1 on OIT screen 28, "Chemical Scale System." If the alarm condition is not cleared within an adjustable but preset time period, YIC 1 initiates shut down of groundwater extraction system and air stripping treatment system.

During filling of the tank T-1, at an operator adjustable but preset value corresponding to a high liquid level in the tank (LSH 22-1), YIC 1 activates an audible and visual alarm at the MCP.

The bulk scale control chemical transfer pump, P 22-3, is manually controlled by an ON/OFF hand-switch (HS 22-4) located adjacent to the pump.

6.4.2.4 System 23 - Process Piping Drain System

Two process piping drain valve systems are located at low points on the air stripping treatment system influent and bypass piping to permit draining of the exposed pipelines extending outside the building for freeze protection. The drain system is displayed at the MCP or OIT screen 30. The theory of the operation and control system for each respective drain valve system

is identical. The following description is exemplary of the operation and control system for air stripper treatment system influent drain valve, FV 23-1.

Operation of valve FV 23-1 is controlled by manual-automatic hand switch, HS 23-1, located at the valve. When HS 23-1 is in manual position, the drain valve is manually operable. When HS 23-1 is in the auto position, the position of the valve is controlled by the MCP. In the auto mode and when the valve is fully open, position switch ZSL 23-1 is triggered, thus activating red alarm light OA 23-1 located at the MCP on the drain system screen. Similarly, when HS 23-1 is in the auto position, and YIC 1 causes the valve to close to the degree established by an adjustable stop on the valve, then position switch ZSH 23-1 is triggered activating green operating light OL 23-1 at the MCP on the drain system screen. YIC 1 closes FV 23-1 when either the groundwater extraction system or the air stripping treatment system is operating. If YIC 1 initiates shutdown of the groundwater extraction system and the air stripping treatment system, then YIC 1 opens FV 23-1 after an operator adjustable but preset time period, which is established as "Freeze Protect" hours on OIT screen 51, "Drain System Settings." In case of power failure, FV 23-1 fails open, which is accomplished by interconnection with the UPS power system.

6.4.2.5 System 24 - Air Stripper Treatment System

The air stripping treatment system removes the volatile organic constituents from the influent groundwater over a range of flow rates ranging from 600 to 1,600 gpm. Air to the air stripping tower is supplied from a centrifugal fan powered by variable frequency drive (VFD). The air stripping control system is designed to maintain a constant but operator adjustable air to water ratio when the air stripping treatment system is operated in the COMPUTER controlled mode; as influent groundwater flow rate increases or decreases, as measured by FE 20-4, YIC 1 proportionally increases or decreases the air flow rate supplied to the air stripping tower, as measured by FE 24-1, by signaling the VFD to speed up or slow down the fan. Air output from the fan is adjustable though its variable frequency drive. When hand switch, HS 24-1 (located on the front panel of the VFD), is in computer controlled position, control of fan motor speed is controlled by YIC 1 as function of influent groundwater flow rate to the air stripping treatment system, as measured by FE 20-4. YIC 1 controls the speed of the fan to obtain the operator adjustable but preset ratio of air flow rate to water flow rate as measured by FE 24-1 and FE 20-4, respectively.

When hand switch HS 24-1 is in LOCAL position, fan speed is controlled by the key pad, HIK 24-1, located at the VFD panel. Operating status parameters for the air stripping system are

indicated at the MCP on OIT screen 31. Operating light, OL 24-1, is provided at the MCP. The speed of the fan is locally indicated at the VFD panel by SI 24-1 and at the MCP. Air flow from the fan is confirmed by the in-line vane-type flow switch, FS 24-1. If the flow switch for the fan is not triggered after the fan has been in an operation for operator adjustable but preset time period, then YIC 1 stops the fan, energizes operation alarm OA 24-1, and immediately initiates shutdown of groundwater extraction system and air stripping treatment system and activates the ADAS. Air flow is measured by FE 24-1 and indicated as rate (FI 24-1) and accumulated total flow (FQI 24-1) at the MCP.

Vibration of fan is monitored by vibration switch, VS 24-1, and if triggered, sends a signal to YIC 1, which immediately stops the fan and energizes alarm light, VA 24-1, at the MCP. Vibration switch must be manually reset at the switch.

Differential pressure across air intake filter unit to fan is monitored by differential pressure element, PDE 24-1, and is locally indicated and transmitted to YIC 1 by indicator/transmitter, PDIT 24-1, and indicated at the MCP as PDI 24-1 on OIT screen 47, "Air Stripper System." If differential pressure across filter unit rises above operator adjustable but preset value (e.g., 0.7 W.C.) established at YIC 1 (i.e., at OIT screen 48, "Filter Differ Press Setpt"), then YIC 1 energizes audible and visual alarm PDAH 24-1 at MCP on OIT screen 31, "Air Stripper System.

Temperature of water in clear well of air stripping tower is monitored by temperature transmitter TT 24-1, which sends a temperature proportional signal to YIC 1. Temperature is indicated at the MCP as TI 24-1 on OIT screen 47, "Air Stripper System." At preset but operator adjustable low temperature (i.e., at OIT screen 48, "Cwell Low Temp Setpt"), YIC 1 activates alarm TAL 24-1 at MCP.

Differential pressure across air stripper tower packing is determined by YIC 1 based on signals received from pressure elements PT 24-2 and PIT 24-1. Differential pressure is indicated at the MCP as PDI 24-2 on OIT screen 47, "Air Stripper System" (i.e., DP A.S.). If differential pressure rises to above an operator adjustable but preset value (PDSH 24-1) established at YIC 1 (i.e., at OIT screen 48, "Airstp Differ Press Setpt"), then at PDIT 24-2, YIC 1 energizes audible and visual alarm PDAH 24-2 at the MCP.

Liquid level in air stripping tower clear well is monitored by LE/LT 24-1 and the signal is transmitted to YIC 1. The liquid in the clear well is indicated at the MCP as LI 24-1 on OIT screen 31,"Water Level." If level in clear well rises above the high level setting LSH 24-1, YIC 1 activates LAH 24-1 at MCP on OIT screen 31, "Cwell #", and reduces bypass flow rate as described for System

21, if bypass line is in service; if bypass system is not in service, YIC 1 reduces influent flow rate as described for System 20. If alarm condition exists after operator adjustable but preset time delay, YIC 1 initiates shutdown of groundwater extraction system and air stripping treatment system and activates the ADAS. The high level set point corresponding to LSH 24-1 is operator adjustable from OIT screen 48, "Cwell High Level Setpt."

Liquid level detection switch LSH 24-2 is provided at the allowable high water level in the liquid distributor at the top of air stripping tower. If water (or foam) level in the distributor rises above maximum allowable level, LSH 24-2 triggers YIC 1 to activate high level alarm light, LAH 24-2, at MCP on OIT screen 31, then YIC 1 shuts down the groundwater extraction system and air stripping treatment system after operator adjustable but preset time delay.

The pH of water leaving air stripper tower clear well is monitored by two independent pH analysis elements, AE 24-1 and AE 24-2, respectively. pH as measured by each of these elements is locally displayed by AIT 24-1 and AIT 24-2 and indicated at the MCP. YIC 1 monitors the difference between pH values as measured by the two pH sensors and activates alarm, ADA 24-1, at the MCP if measured difference exceeds an operator adjustable but preset value for an operator adjustable but preset time period, both established at YIC 1 at OIT screen 48, "Air Stripper Settings." If the pH, as measured by either analysis element, exceeds operator adjustable but preset value established at OIT screen 48 ("High pH Set Point"), then YIC 1 activates a high pH alarm, AAH 24-1, at the MCP on OIT screen 31. Similarly, if pH as measured by either analysis element is less than operator adjustable but preset value established at YIC 1, YIC 1 activates low alarm AAL 24-1 at the MCP on screen 31. If after operator adjustable but preset time period the alarm condition is not cleared, YIC 1 shuts down groundwater extraction systems and air stripping treatment system and activates the ADAS.

6.4.2.6 System 25 - Batch Cleaning System

Operation of air stripper treatment system may result in formation of calcium carbonate and/or biological growth on air stripper tower packing. Such scale and biological growth, if allowed to accumulate, will impair the performance of air stripper treatment equipment system. The batch cleaning system is used to remove these accumulated materials from the air stripping tower packing. During batch cleaning process, the groundwater extraction system must be off. Air stripping fan, if operated, shall only be operated in the manual mode.

Operation of batch cleaning pump, P 25-1, is controlled by HOA hand switch HS 25-1 located at the MCP on OIT screen 34. Operation light, OL 25-1, and alarm light, OA 25-1, are provided to indicate pump status at MCP. When HS 25-1 is in hand position, P 25-1 operates without regard to control interlocks provided by YIC 1. When HS 25-1 is placed in auto position, operation of pump P 25-1 is controlled by YIC 1. When HS 25-1 is placed into the auto position, YIC 1 closes FCV 20-1 and LCV 21-1 and receives verification of valve closure by receiving signals from position switches ZSL 20-1 and ZSL 21-1, respectively. YIC 1 will not allow pump P 25-1 to operate in auto mode until these valves are fully closed. If level in clear well as measured by LE 24-1 is within operator adjustable but preset level range (i.e., between the Cwell low level setpt and Cwell high level setpt) established at OIT screen 34, then operator may start the pump by pressing the start, PS 25-1, button on OIT screen 34. YIC 1 shall start pump P 25-1 causing recirculation flow of cleaning solution through air stripping tower. Priming of P 25-1 can be accomplished by adding potable water through operation of HV 29-3. If level in clear well falls below operator adjustable but preset level set point for P 25-1, YIC 1 stops P 25-1.

Successful recirculation system is indicated to YIC 1 by triggering of pressure switch, PS 25-1. If after operator adjustable but preset time period of operation of P 25-1 and PS 25-1 fails to signal YIC 1, then YIC 1 will stop the pump, and activate operation alarm light OA 25-1 on OIT screen 33 at the MCP.

Recirculation flow rate is manually controlled by throttling valve HV 25-3 located on discharge pipeline from pump P 25-1. Recirculated solution flow rate is monitored by FE 25-1 with the resulting flow signal transmitted to YIC 1 by FIT 25-1. YIC 1 indicates the flow rate and calculates the total accumulated flow and displays the resultant as FQI 25-1 at the MCP on OIT screen 33.

YIC 1 through FE 25-1 also serves to assist the operator in controlling the rate and quantity of potable water added to the air stripping tower for both preparation of batch cleaning solution or for system flushing. For both of these conditions, the operator may enter at the MCP a predetermined volume of water to be added to the air stripper tower. After YIC 1 determines that the operator set volume of water has been conveyed to the air stripping tower as calculated from the FT 25-1 signal, YIC 1 initiates an audible and visual alarm at the MCP.

Batch cleaning chemical addition can be accomplished through operation of chemical addition system 26. Batch cleaning defoaming agent can be injected into batch cleaning solution by operation of System 27.

The time required for batch cleaning must be empirically determined. The operator has the option of controlling the batch cleaning cycle based on either the total volume to be recirculated as compared to FQI 25-1 or total time for the solution to be recirculated.

After batch cleaning is determined complete by the operator, operator must manually turn off all batch cleaning chemical addition systems that may have been used during the batch cleaning cycle by placing appropriate hand switches for Systems 26 and 27 in off position. Spent batch cleaning solution may be pumped by P 25-1 from air stripping tower discharge drain pipeline to truck load connection or to batch cleaning tank, T-3. Spent batch cleaning solution may be conveyed by operation of P 25-1 in hand mode to allow the level in the clear well to be pumped below the low clear well level set point. Residual batch cleaning solution must be flushed from the air stripping tower and batch cleaning recirculation piping and appurtenances through manual activation of potable water flush system by operation of HV 29-3. The used flush water should be combined with the residual batch cleaning solution.

Storage tank T-3 is provided as part of the batch cleaning system for accumulation of residual batch cleaning solution. Liquid level in tank is monitored by LE 25-1 and level proportional signal is transmitted by LIT 25-1 to YIC 1. Level in the tank is indicated by LI 25-1 at the MCP on OIT screen 33. Another level sensing device (LSH 25-1) is provided at the batch cleaning storage tank to detect high level condition in the tank caused by foam or liquid. If level in tank rises to level established for LSH 25-1 or other level alarm set point established at YIC 1 for LI 25-1, then both audible and visual alarms (LAH 25-1) are triggered at MCP and YIC 1 stops batch cleaning recirculation pump, P 25-1. Audible alarm is silenced by operator acknowledging alarm condition at MCP; however, alarm light, LAH 25-1, remains energized until alarm condition is cleared.

Spent batch cleaning solution in batch cleaning tank T-3 may be disposed of by transporting to approved disposal facility. Spent batch cleaning solution may be pumped directly from tank truck load connection or through tank truck load connection located on discharge piping from P 25-1 at HV 25-5. Pump 25-1 may be used to convey spent batch cleaning solution to truck by operation of P 25-1 in hand mode; however, use of the portable air diaphragm pump is the preferred means for transferring residual batch cleaning solution from T-3. When HS 25-1 is in hand position, P 25-1 shall operate regardless of signals received at YIC 1; therefore, extreme caution must be exercised by operator to prevent unintentional discharge of spent batch cleaning solution and pump damage. When HS 25-1 is in auto position, P 25-1 shall operate only if YIC 1 signals that liquid level in the

batch cleaning storage tank as measured by LE 25-1 is within operator adjustable but preset range established for operation of P 25-1.

6.4.2.7 System 26 - Batch Cleaning Chemical Feed System

Batch cleaning chemical feed system operates in conjunction with the batch cleaning system described under system 25, if necessary, depending upon the selected chemical composition of the cleaning solution used. Batch cleaning solution chemicals shall be added to batch cleaning solution piping on the suction side of pump P 25-1. Operation of drum pump P 26-1, is controlled through hand switch, HS 26-1, located at pump. Extreme caution shall be exercised by the operator when handling concentrated chemical cleaning solutions. Refer to material safety data sheets, included in Appendix C, for additional personnel and environmental precautions.

6.4.2.8 System 27 - Batch Cleaning Defoamer Feed System

Batch cleaning defoamer feed system operates in conjunction with the batch cleaning system described under System 25, if desired by operator. Batch cleaning defoamer is injected into batch cleaning solution piping on suction side of pump P 25-1. Operation of P 27-1 is controlled through a HOA hand switch HS 27-1 located at unit control panel 27 mounted adjacent to P 27-1. Operating lights, OL 27-1 and OL 27-2, are energized at UCP and MCP (i.e., at OIT screen 33), respectively, when pump is operating. When HS 27-1 is in hand position, P 27-1 operates regardless of any signal received at UCP by YIC 1. When HS 27-1 is in auto position, P 27-1 operates only if YIC 1 signals that P 25-1 is in operation. Flow from batch cleaning defoamer feed pump is monitored by FS 27-1; if YIC 1 fails to detect activation of FS 27-1, as indicated by the flow status indicator on OIT screen 33, after adjustable but preset time period, then YIC 1 stops P 27-1 and activates alarm light OA 27-1 at MCP. YIC 1 stops P 27-1 immediately whenever P 25-1 is OFF, stopped, failed, or in alarm status. Defoamer injection flow rate by P 27-1 shall be manually controlled with the local stroke and pulse frequency controls provided on defoamer feed pump. Defoamer is pumped directly from the defoamer chemical drum. Defoamer level in drum is locally monitored and indicated by LI 27-1.

6.4.2.9 System 28 - Sump Pump System

Sump pump system consists of three separate pumping systems: building drain sump pump (P 28-1); air stripping tower containment area sump pump (P 28-2); and batch cleaning tank

containment sump pump (P 28-3). Building drain sump collects water from several sources within the building and the water is pumped to the air stripping treatment system influent pipeline. Air stripping tower and batch cleaning tank containment area sumps collect rainwater, as well as other water collected in sumps, and conveys it to air stripping treatment system influent pipeline.

Building drain sump system utilizes a submersible sump pump, P 28-1, which is controlled by HOA switch, HS 28-1, located at the motor starter panel (MSP-1) in the electrical room and an off/auto switch on OIT screen 57. When HS 28-1 is placed into the hand position, pump operates without regard to level switch interlocks. When HS 28-1 is placed in the to auto position and the switch at OIT screen 57 is in auto position, P 28-1 operates in response to triggering of a wide angle float level switch. When level of water in building drain sump rises to adjustable but preset level, LS 28-1 is triggered, which in-turn starts pump P 28-1. Pump P 28-1 operates continuously until LS 28-1 signals YIC 1 that level in sump is low; YIC 1 then stops P 28-1. A second level switch, LS 28-2, monitors water level in sump and activates LAL 28-1 if water level falls below preset liquid level or LAH 28-1 if water rises above preset liquid level. If alarm condition due to high water level exists after operator adjustable but preset time delay, YIC 1 shuts down extraction system and air stripping treatment system and activates the ADAS.

A truck unload connection is provided outside the treatment building to accommodate the treatment of well development and purge water that might be transported to the facility by tanker truck for disposal. A motor-actuated valve FCV 28-1 is controlled by YIC 1 through open-close hand switch HS 28-7 located on OIT screen 57 at the MCP. When HS 28-7 is placed into the closed position, YIC 1 sends a signal to valve position controller ZC 28-1 to close the valve. When the valve is fully closed, position switch ZSL 28-1 signals YIC 1; YIC 1 then energizes closed lights: OA 28-2 at MCP on OIT screen 54 and OA 28-3 at UCP 28, which is located outside the treatment building near the truck load connection. When HS 28-7 is placed in the open position, YIC 1 signals ZC 28-1 to open FCV 28-1; position switch ZSH 28-1 signals YIC 1 when FCV 28-1 is open; then YIC 1 energizes OL 28-2 at the MCP and OL 28-3 at UCP 28 indicating to the operator that the truck unload station is ready to receive flow. Operation of FCV 28-1 is interlocked with both HS 28-1 and LS 28-2. If HS 28-1 is not in the auto position or YIC 1 detects a failure of P 28-1 then YIC 1 closes FCV 28-1 and prevents opening of FCV 28-1 if already closed. If YIC 1 detects a high liquid level in the sump as triggered by LS 28-1 (LA 28-1), then YIC 1 closes FCV 28-1.

A leak detection switch AS 28-1 is installed in the annular space beneath and around building drain sump tank T-2 and signals YIC 1 if liquid is detected; Upon receiving leak signal, YIC 1 energizes alarm light AA 28-1 at MCP.

Off-gas from building sump is controlled by operation of exhaust fan EF 28-1 using a hand-off-auto hand switch HS 28-11 located at the MCP on OIT screen 57. A local lock-out-stop hand switch HS 28-10 located on the wall of the building adjacent to the sump prevents power from being applied to fan regardless of position of HS 28-11. When HS 28-11 is in hand position EF 28-1 operates independent of system interlocks. When HS 28-11 is in auto position, EF 28-1 operates on an operator adjustable but present time interval and for an operator adjustable but preset duration established at OIT screen 49. In addition, when HS 28-11 is in the auto position, YIC 1 operates the fan continuously whenever P 28-1 is operating. Operation of the fan is monitored by YIC 1 and indicated at the MCP as OL 28-6 on OIT screen 54; YIC 1 detects fan motor failure and in event of such failure indicates failure at MCP as OA 28-6.

Operation and control of the air stripping tower containment area sump and the batch cleaning tank containment area sump is identical. The former system is described below and is exemplary of both systems.

Air stripping tower containment area sump has submersible sump pump P 28-2 which is controlled by a HOA switch, HS 28-3, located at MSP-1 located in the electrical room and an off/auto switch located on screen 57. In hand position, pump operates without regard to level switch interlocks. When both switches are in the auto position, P 28-2 operates in response to triggering of level switches. When level of water in air stripping tower containment area sump rises to a preset level, LS 28-3 is triggered, which in-turn starts P 28-2. P 28-2 operates continuously until LS 28-3 signals YIC 1 that level in sump is low; YIC 1 then stops P 28-2. A second level switch, LS 28-4, monitors the water level in sump and activates LAL 28-2 if the level in sump falls below or rises above preset liquid levels. If alarm condition due to high water level exists after operator adjustable but preset time delay, YIC 1 shuts down the groundwater extraction system and the air stripping treatment system and activates ADAS.

The temperature of the water in the air stripper tower sump is monitored by temperature transmitter TT 28-1, which sends a signal proportional to temperature to YIC 1. Temperature of the monitored liquid is indicated at the MCP as TI 28-1 on OIT screen 57. An electric-powered submersible unit heater IH 28-1 is installed in the sump to prevent freezing of the residual water in the sump. Operation of the heater is controlled though a hand-off-auto hand switch HS 28-7

located at the MCP. A local lock-out-stop hand switch HS 28-8 interrupts power to the heater if placed in off position. When HS 28-7 is in the hand position, the heater operates without regard to the temperature and level interlocks; however, YIC 1 interrupts the power supply to the heater after a preset time period; if the heater is operated in the hand mode and the timer at YIC 1 times-out, then YIC 1 interrupts the power supply to the heater until the operator resets the system by placing the HS 28-7 in the off position. When HS 28-7 is in the auto position, operation of the heater is controlled by YIC 1 based on the monitored temperature of the liquid in the sump relative to the heater set point temperature established at OIT screen 49. Assuming HS 28-7 is in the auto position, YIC 1 allows IH 28-1 to be energized only if the temperature of the water in the sump is less than the low temperature set point established at OIT screen 49 and the liquid level in the sump is as monitored by LS 28-4 is at or above the pump shut off level. YIC 1 maintains the temperature of the liquid in the sump at the operator adjustable but preset temperature. If the temperature of the liquid in the sump falls 3 degrees below the temperature set point, then YIC 1 activates a low temperature alarm TAL 28-1 at the MCP. If the water level in the sump is below the low water alarm level, then YIC 1 does not energize the heater.

Water accumulation in the floor sump separating the control room from the process area is monitored by a liquid level float switch LSH 28-1. The sump is outfitted with a gravity drain that discharges outside the building onto the paved area on the south side of the building. If water accumulates in the sump, LSH 28-1 signals YIC 1 that the process area is flooded and causes LAH 28-1 to be activated at MCP. If after an operator adjustable but preset time period the alarm condition is not acknowledged at the MCP, YIC 1 shuts down the groundwater extraction system and air stripping treatment system and activates the ADAS.

6.4.2.10 System 29 - Potable and Industrial Water Systems

The potable water system is manually controlled and distributed to several locations within the treatment plant. A cross connection to the potable water system with a reduced pressure double back flow prevention system provides the source water for the industrial water system. Flushing connections are provided from the industrial water system to certain process piping.

Three emergency showers and eye wash units are provided, one in the process area, one in the air stripper tower containment area, and one in the batch cleaning tank containment area. The water supply to each eye wash is monitored by a flow switch, FS 29-1, FS 29-2, and FS 29-3. Flow switches are monitored by YIC 1. If a flow switch is activated, YIC 1 activates an alarm FA 29-1 at

the MCP. If after an operator adjustable but preset time period, the alarm is not acknowledged, YIC 1 activates the ADAS and the security/fire alarm system.

Hose bibs for general industrial water use are provided at numerous locations around the interior and exterior of the treatment facility. Water from these hose bibs originates from the potable water system, but is considered industrial water that is not potable. DO NOT DRINK THIS WATER! Drinking water can be obtained from the facility laboratory sink faucet and toilet room sink faucet.

6.4.3 RADIO TELEMETRY SYSTEM

The radio telemetry system provides for communication of the programmable logic controller at each wellhead (YIC 101 - 111) with the programmable logic controller at the MCP. The system utilizes very high frequency (VHF) radio communication equipment to send control instructions, monitoring data, and status messages between each of the extraction well sites and the treatment facility. Operation of the system is regulated by the Federal Communications Commission (FCC), and the County has a license from the FCC to operate the system; a copy of the license is presented in Appendix E. The system must not be modified without prior approval of the FCC. All antennas serving the well sites are located on dedicated wood utility poles, except for the antenna for well CP-W3, which is located on a light pole in the transfer station. The antennas for the four south extraction wells are mounted on a single common pole. The antennas for wells CP-E1 and CP-E3 are also mounted on a single common pole. All other antennas are individually located. The antenna at the treatment facility for YIC 1 is located at the top of the air stripping tower.

The main telemetry unit (MTU) at the treatment facility interrogates each of the remote telemetry units (RTU) at the wells on a fixed sequence. The MTU makes a preset number of attempts to establish a communication link with each of the respective RTUs. If the link is successful, then the MTU transfers all the set points for that specific well to the RTU, then the RTU transfers the appropriate monitoring data (e.g., pump on/off, flow rate, total accumulated flow, pressure, water level, level or flow mode of control, variable frequency drive output, and any existing alarm conditions) to the MTU. After the data transfer is complete, the MTU sequences to the next RTU in the interrogation sequence. If the communication link is not successful after completing the preset number of attempts, then the MTU records the failed communication attempt and proceeds to the next well site RTU in the interrogation sequence. The MTU continues to

establish a link with each well on each cycle through the interrogation sequence. Once a communication link is successfully made between MTU and RTU, all recorded counts of previously failed communication attempts are cleared. If a communication link cannot be made after a preset number of interrogation cycles, the YIC 1 signals that there is a communication system failure at the respective well. The programmable controller at each well site starts a timer after each communication link with the MTU. If a communication link has not been successfully made after the preset time period established at each respective well site YIC, then the YIC at the well stops the pump.

A radio communication survey for the system was completed prior to its installation and, based on this survey, operating frequencies for the radio telemetry system were selected. This survey indicated that the selected frequencies were not used at the time of the survey in the areas of the wellheads and treatment facility and, therefore, the radio telemetry system would not interfere or conflict with any existing uses of these frequencies or with existing electrical or communications equipment. However, the potential exists that intermittent users of these frequencies were not detected by the radio survey or that new users may attempt to use these frequencies without authorization. Also, randomly generated noise could also affect the system and/or emissions from the system could affect other existing electrical or communications equipment.

The operator should be alert for any communication difficulties and should respond to any citizen complaints of interference. Communications difficulties and interferences, if they occur, will likely be intermittent and beyond the capability of the operator to identify and correct. In the event of difficulties, it is recommended that the operator consult with Electronic System Technology, Kennewick, Washington, who is the equipment manufacturer.

6.4.4 AUTOMATED TELEPHONE DIALING ALARM SYSTEM

The control systems for the groundwater extraction and air stripping treatment systems are designed to allow the systems to operate without continuous operator oversight at the facility. Nevertheless, problems related to these systems or site security may arise that will require prompt attention by qualified personnel. Therefore, the facility is equipped with an ADAS to automatically call into 16 pre-programmed telephone numbers to notify appropriate personnel when problems arise. When activated by YIC 1 at the main control panel in the treatment facility, the ADAS calls the first programmed telephone number and plays appropriate prerecorded messages for the alarm

conditions. If a busy signal or no answer is obtained, the ADAS aborts the call and proceeds to call the next telephone number on the pre-established list of telephone numbers. If the call is answered, the ADAS plays the appropriate prerecorded message and waits for acknowledgment from the person called. If acknowledgment is not received, the ADAS system continues to call the remaining programmed telephone numbers until a call is properly acknowledged. The system then waits a preset but operator adjustable time period. If the problem or alarm condition is not corrected within this time period, the ADAS system initiates the notification cycle again starting with the first phone number on the selected list.

TABLE 6-1

SYSTEM CODES

System Code	Description
20	Influent from groundwater extraction system
21	Air stripping tower bypass system
22	Scale control chemical injection system
23	Automated freeze protection drain system
24	Air stripping treatment fan system
25	Batch cleaning system
26	Miscellaneous chemical feed systems
27	Defoamer feed system
28	Building and contaminant sump systems
29	Potable water system
101	Well CP-S1
103	Well CP-S4
104	Well CP-S5
105	Well CP-S6
106	Well CP-E1
107	Well CP-E2
108	Well CP-E3
109	Well CP-W1
110	Well CP-W2
111	Well CP-W3

TABLE 6-2

SUMMARY OF VALVE SETTINGS FOR ROUTINE OPERATION OF GROUNDWATER EXTRACTION SYSTEM

Valve	Description/Location	Status
HV X-1	Wellhead sample collection valve	Closed
HV X-2	Wellhead pressure indicator isolator	Open
HV X-3	Wellhead discharge	Open

TABLE 6-3

SUMMARY OF VALVE SETTINGS FOR ROUTINE OPERATION OF AIR STRIPPING TREATMENT SYSTEM

Valve	Description/Location	Status
HV 20-1, HV 20-2, HV 20-3	Influent line shut-off	Open
FCV 20-1	Influent line flow control valve	Motorized, automatic operation, normally open
HV 20-4, HV 20-6, HV 20-8, HV 20-10, HV 21-4	Sample line isolation valve	Closed
HV 20-5, HV 20-7, HV 20-9, HV 20-11, HV 21-5, HV 24-2	Sample collection valve	Open
HV 20-12, HV 21-6	Pressure transmitter isolation valve	Open
HV 21-1, HV 21-2, HV 21-3	Bypass isolation valve	Closed
LCV 21-1	Bypass flow control valve	Motorized, automatic operation, normally closed
HV 22-10	Truck unload isolation valve	Closed
HV 22-12	Scale control chemical injection system isolation valve (see Table 6-4 for valve settings for remainder of scale control chemical injection system)	Open
FV 23-1	Air stripper influent pipeline drain (for maintenance and freeze protection)	Motorized, automatic operation, normally closed
FV 23-2	Air stripper bypass pipeline drain (for maintenance and freeze protection)	Motorized, automatic operation, normally closed
HV 24-1	Truck load from air stripping tower	Closed
HV 24-3	Treated groundwater discharge	Open
HV 24-4	Air stripper clear well drain valve	Closed
H 24-5, HV 24-6	pH sensor loop isolation valve	Open
HV 25-5, HV 25-8, HV 25-11	Truck load/unload isolation valve	Closed
HV 25-1, HV 25-2	Batch cleaning recirculation isolation valve	Closed

TABLE 6-3

SUMMARY OF VALVE SETTINGS FOR ROUTINE OPERATION OF AIR STRIPPING TREATMENT SYSTEM

Valve	Description/Location	Status
HV 25-3	Batch cleaning recirculation isolation valve	Closed
HV 25-6	Batch cleaning recirculation isolation valve	Closed
HV 25-7, HV 25-9	Batch cleaning storage tank isolator (see Table 6-5 for valve settings for batch cleaning system)	Closed
HV 25-12	Spare injection/sample port	Closed
HV 25-6	Clear well recirculation system isolation valve	Closed
HV 26-1	Chemical feed system isolation valve	Closed
HV 27-4	Defoamer system isolator (see Table 6-7 for valve settings for defoamer system)	Closed
HV 28-1, HV 28-2, HV 28-3	Sump discharge control (to air stripping tower or truck unload)	Directed to air stripping tower
HV 28-4	Sump discharge isolation valve	Open
HV 29-3	Potable water system isolation valve	Closed

TABLE 6-4

SUMMARY OF VALVE SETTINGS FOR ROUTINE OPERATION OF SCALE CONTROL CHEMICAL INJECTION SYSTEM

Valve	Description/Location	Status
HV 22-1	Tank T-1 discharge	Open
HV 22-2	Scale control chemical calibration cylinder isolation valve	Closed
HV 22-3, HV 22-4, HV 22-5, HV 22-6	Pump P22-1, P22-2 isolation valve	Open
HV 22-7, HV 22-8	Scale control chemical system drain/flush	Closed
HV 22-9	Drum unload isolation valve	Closed
HV 22-10	Truck unload isolation valve	Closed
HV 22-11	Tank fill isolation valve	Closed
HV 22-12	Influent line isolation valve	Open
HV 22-13	Drum unload isolation valve	Closed

TABLE 6-5

SUMMARY OF VALVE SETTINGS FOR BATCH CLEANING SYSTEM

Valve	Description/Location	Status During Routine Operation of Air Stripping Treatment System	Status During Batch Cleaning Startup	Status During Batch Cleaning Routine Operation (Recirculation)
HV 25-1	Air stripping tower discharge line isolator	Closed	Open	Open
HV 25-2	Pump P25-1 upstream shutoff	Closed	Closed	Open
HV 25-3	Influent line isolator	Closed	Closed	Open
HV 25-4	Isolator from air stripping tower discharge line	Closed	Open	Closed
HV 25-5	Truck load isolator	Closed	Closed	Closed
HV 25-6	Clear well return isolator	Closed	Open	Closed
HV 25-7	Tank T-3 isolator	Closed	Closed	Closed
HV 25-8	Truck unload isolator	Closed	Closed	Closed
HV 25-9	Tank T-3 inlet isolator	Closed	Closed	Closed
HV 25-10	Tank T-3 discharge	Closed	Closed	Closed
HV 25-11	Tank T-3 Truck load	Closed	Closed	Closed
HV 25-17, HV 25-18	Pump P25-1 seal flush	Open	Open	Open
HV 25-19	Pump P25-1 seal flush flow control	Open	Adjust as required	Adjust as required

TABLE 6-6

SUMMARY OF VALVE SETTINGS FOR BATCH CLEANING SOLUTION DISPOSAL SYSTEM

Valve	Description/Location	Status During Routine Operation of Air Stripping Treatment System (without BC Solution Disposal)	Status During Spent Batch Cleaning Solution Disposal Startup and Routine Operation
HV 25-1, HV 25-2	Recirculation isolators	Closed	Closed
HV 25-7, HV 25-10	Tank T-3 discharge	Closed	Open
HV 25-12	Isolator, inlet from recirculation line	Closed	Open
HV 25-13	Calibration cylinder isolator	Closed	Closed
HV 25-14	System inlet drain/flush	Closed	Closed
HV 25-15	System discharge drain	Closed	Closed
HV 25-16	Isolator, discharge to air stripping tower discharge line	Closed	Open

TABLE 6-7

SUMMARY OF VALVE SETTINGS FOR ROUTINE OPERATION OF THE DEFOAMER FEED SYSTEM

Valve	Description/Location	Status During Routine Operation of Air Stripping Treatment System	Status During Batch Cleaning
HV 27-1	Drum unload isolator	Closed	Open
HV 27-2	System drain/flush	Closed	Closed
HV 27-3	System drain	Open	Closed
HV 27-4	Recirculation isolator	Closed	Open

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
101 (CP S-1)	Groundwater extraction rate [well flow setpt)	1	38	0 - 90	gpm	90
	Groundwater level set point [well level setpt]	1	38	1 - 19.8	ft	3
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed/ reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	50 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	5
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	10
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	5
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	20
	Low water level alarm [low water level cutoff]	2	5	1 - 13	ft	1
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	600
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	Intruder alarm control [well S1 armed]	2	52	armed/ unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
103 (CP S-4)	Groundwater extraction rate [well flow setpt]	1	38	0 - 90	gpm	15
	Groundwater level set point [well level setpt]	2	38	1 - 15.8	ft	2
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed/ reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	50 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	1
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	70
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	1
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	70
	Low water level alarm [low water level cutoff]	2	5	1 - 9	ft	1
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	60
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	Intruder alarm control [well S1 armed]	2	52	armed/ unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
104 (CP S-5)	Groundwater extraction rate [well flow setpt]	1	38	0 - 90	gpm	50
	Groundwater level set point [well level setpt]	1	38	1 - 14.8	ft	2
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed/ reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	50 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	1
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	70
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	1
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	70
	Low water level alarm [low water level cutoff]	2	5	1 - 9	ft	1
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	60
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	intruder alarm control [well S1 armed]	2	52	armed/ unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
105 (CP S-6)	Groundwater extraction rate [well flow setpt]	1	38	0 - 90	gpm	60
	Groundwater level set point [well level setpt]	1	38	1 - 14.8	ft	5
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed/ reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	50 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	5
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	10
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	5
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	10
	Low water level alarm [low water level cutoff]	2	5	1 - 9	ft	1
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	60
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	Intruder alarm control [well S1 armed]	2	52	armed/ unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
106 (CP E-1)	Groundwater extraction rate [well flow setpt]	1	38	0 - 200	gpm	160
	Groundwater level set point [well level setpt]	1	38	1 - 42.8	ft	24
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed/ reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	50 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	5
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	10
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	5
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	20
	Low water level alarm [low water level cutoff]	2	5	1 - 32	ft	15
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	60
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	Intruder alarm control [well S1 armed]	2	52	armed/ unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
107 (CP E-2)	Groundwater extraction rate [well flow setpt]	1	38	0 - 8	gpm	4
	Groundwater level set point [well level setpt]	1	38	1 - 40.8	ft	5
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed / reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	50 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	5
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	50
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	5
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	20
	Low water level alarm [low water level cutoff]	2	5	1 - 31	ft	2
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	60
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	Intruder alarm control [well S1 armed]	2	52	armed / unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
108 (CP E-3)	Groundwater extraction rate [well flow setpt]	1	38	0 - 200	gpm	65
	Groundwater level set point [well level setpt]	1	38	1 - 32.8	ft	17
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed/ reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	50 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	5
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	10
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	5
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	20
	Low water level alarm [low water level cutoff]	2	5	1 - 24	ft	5
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	60
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	Intruder alarm control [well S1 armed]	2	52	armed/ unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
109 (CP W-1)	Groundwater extraction rate [well flow setpt]	1	38	0 - 250	gpm	125
	Groundwater level set point [well level setpt]	1	38	1 - 95.8	ft	80
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed / reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	50 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	5
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	10
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	5
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	20
	Low water level alarm [low water level cutoff]	2	5	1 - 85	ft	20
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	60
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	Intruder alarm control [well S1 armed]	2	52	armed / unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
110 (CP W-2)	Groundwater extraction rate [well flow setpt]	1	38	0 - 250	gpm	130
	Groundwater level set point [well level setpt]	1	38	1 - 55.5	ft	53
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed/ reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	0 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	5
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	10
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	5
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	20
	Low water level alarm [low water level cutoff]	2	5	1 - 57	ft	5
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	60
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	Intruder alarm control [well S1 armed]	2	52	armed/ unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
111 (CP W-3)	Groundwater extraction rate [well flow setpt]	1	38	0 - 250	gpm	175
	Groundwater level set point [well level setpt]	1	38	1 - 55.8	ft	42
	Intruder alarm delay [ack intrdr alarm]	1	38	0 - 300	sec	60
	Start well [start S1]	1	39	--	--	--
	Stop well [stop S1]	1	39	--	--	--
	Radio communication system [reset S1]	1	56	failed/ reset	--	--
	Time delay for alarm on startup [press shtoff pump]	2	5	0 - 300	sec	20
	Pump start speed [pump start speed]	2	5	0 - 100	%	50
	Level PID gain [level pump gain]	2	5	0 - 255	none	5
	Level PID reset [level pump reset]	2	5	0 - 255	resets per minute	10
	Flow PID gain [flow pump gain]	2	5	0 - 255	none	5
	Flow PID reset [flow pump reset]	2	5	0 - 255	resets per minute	20
	Low water level alarm [low water level cutoff]	2	5	1 - 43	ft	10
	High pressure alarm [high press setpt]	2	5	0 - 100	psi	60
	Low pressure alarm [low press setpt]	2	5	0 - 150	psi	10
	Intruder alarm control [well S1 armed]	2	52	armed/ unarmed	--	armed

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
20	Wells to treatment facility [flow error; %]	1	25	0 - 100	%	3
	ADAS notification delay [ack flow error]	1	25	0 - 3600	sec	
	Influent pressure alarm [pipe max pressure]	1	25	1 - 100	psi	
	Time delay for overpressure [over press shutdn]	1	25	0 - 3600	sec	
	maximum water in clear well [cwell level setpt]	1	25	0 - 5	ft	
21	Maximum water in clear well [cwell level setpt]	1	27	0 - 5	ft	
	Bypass pressure alarm [over press setpt]	1	27	0 - 100	psi	
	System shutdown acknowledge [ack system shutdn]	1	27	0 - 3600	sec	
	Time delay for overpressure [enable bypass system]	1	27	0 - 3600	sec	
22	Start/stop scale control P22-1 [start/stop P22-1)	1	29	start/ stop	none	start
	Start/stop scale control P22-2 [start/stop P22-2]	1	29	start/ stop	none	stop
	Duty pump selection [P22-1/P22-2]	1	29	no duty/ P22-1/ P22-2	none	P22-1
	Time delay on ADAS for duty and S.B. failure [ack standby fail]	1	29	0 - 1000	hr	72
	Time delay before TF shutdown if chem low [ack no chem scale avail]	1	29	0-7200	min	7200

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
22 (cont.)	[low tank level setpt]	1	29	0 - 10	ft	2
	[high tank level setpt]	1	29	0 - 10	ft	5
23	Influent drain valve [manual/automatic]	1	51	manual/ auto	none	auto
	Influent drain manual close [manual drain valve close]	1	51	close	none	NA
	influent drain manual open [manual drain valve open]	1	51	open	none	NA
	Bypass drain valve [manual/auto]	1	51	manual/ auto	none	auto
	Bypass drain manual close [manual drain valve close]	1	51	close	none	NA
	Bypass drain manual open [manual drain valve open]	1	51	open	none	NA
	Time delay after system shutdown to drain [freeze protect]	1	51	0 - 100	hr	4 (winter) 100 (summer)
24	Air to water ratio set point [air to water ratio]	2	32	20 - 300	none	100
	Enable/disable VFD [enable/disable]	1	48	enable/ disable	none	enable
	Start/stop fan [start/stop]	1	48	start/ stop	none	start
	Time delay to stop - no air flow [shutdown no air flow]	1	48	1 - 300	sec	60
	Air filter different press alarm set point [filter differ press setpt]	1	48	1 - 5	inch water	2
	Clear well low temp set point [cwell low temp setpt]	1	48	32 minimum		

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
24 (cont.)	Air stripper differ press alarm set point [airstp differ press setpt]	1	48			
	Clear well level high shutdown delay [shutdn cwell depth setpt]	1	48	0 - 300	sec	5
	Clear well level high alarm setpt [cwell high level setpt]	1	48	1 - 5	ft	
	Distribution tray high alarm shutdown delay [shutdn high tray]	1	48	0 - 300	sec	
	Different pH alarm set point [excess differ pH setpt]	1	48	1 - 20	0.1 pH units	
	Different pH alarm time delay [excess differ pH duration]	1	48	1 - 1440	minutes	
	High pH alarm set point [high pH setpt]	1	48	7 - 12	pH units	
	Low pH alarm set point [low pH setpt]	1	48	2 - 7	pH units	
	Time delay for system shutdown pH [shutdn pH error]	1	48	1 - 100	hr	
	pH alarm system enabled/disabled [pH system enabled/disabled]	1	48	enabled/ disabled	NA	enabled
	Fan VFD failure reset [reset VFD]	1	48	reset	NA	NA
	Extraction and treatment system shutdown [reset system shutdn]	3	50	reset	NA	NA
	Audible alarms on/off [audible alarms on/off]	3	50	on/off	NA	on

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
25	Clear well high level alarm set point [cwell high level setpt]	1	34	0 -	ft	5
	Low pump discharge press time delay [shutof if no line press]	1	34			
	Total volume for batch cleaning set point [volume solutn setpt]	1	34		gal	
	Batch clean time duration set point	1	34		hr	
	Maximum allowable run time in manual mode [shutof recirc pump manual]	1	34			
	Clear well low level alarm set point [cwell low level setpt]	1	34			
	Batch clean mode volume/time [volume select][time select]	1	34	gal/hr	none	time
	Batch cleaning pump control [P25-1 manual][P25-1 off][P25-1 auto]	1	34	manual/ off/auto	none	off
	Batch clean pump start/stop [start/stop P25-1]	1	34	start/ stop	none	stop
	Batch cleaning tank high level set point [T-3 high level setpt]	1	34	1 - 16	ft	
	Batch cleaning tank low level set point [T-3 low level setpt]	1	34	1 - 16	ft	
27	Time delay - no defoamer flow [defoamer pump alarm time]	1	34	0 - 300	sec	

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
28	Facility shutdown-air strip sump high [shutdn a sump high water]	1	36	0 - 3600	sec	
	Facility shutdown-control room sump high [shutdn water control room]	1	36	0 - 300	sec	
	Facility shutdown batch clean sump high [shutdn BC sump high water]	1	36	0 - 3600	sec	
	Air strip sump heater run time manual [shtoff a sump heater]	1	36	0 - 3600	sec	
	Batch clean sump heater run time manual [shtoff BC sump heater]	1	36	0 - 3600	sec	
	Facility shutdown-building sump high [shutdn B sump high water]	1	49	0 - 3600	sec	
	Building sump exhaust fan run interval [sump ex fan intrvl]	1	49	0 - 240	0.1 hr	
	Building sump exhaust fan run duration [sump ex fan duratn]	1	49	0 - 240	0.1 hr	
	Set point temp for air stripper sump heater [a sump temp heater setpt]	1	49	32 - 70	°F	
	Set point temp for BC sump heater [BC sump temp heater setpt]	1	49	32 - 70	°F	
	Batch cleaning sump pump control [P28-3 off/P28-3 auto]	1	57	off/auto	NA	auto
	Batch cleaning sump heater control [IH 28-2 manual][IH 28-2 off][IH 28-2 auto]	1	57	manual/ off/auto	--	off

TABLE 6-8

LIST OF OPERATOR ADJUSTABLE PARAMETERS

System	Description	Operator Security Level	Operator Interface Screen Number	Range of Values	Units	Recommended Default Value
28 (cont.)	Air stripper sump pump control [P28-2 off/P28-2 auto]	1	57	off/auto	--	auto
	Air stripper sump heater control [IH 28-1 manual][IH 28-1 off][IH 28-1 auto]	1	57	manual/ off/auto	--	off
	Building sump pump control [P28-1 off][P28-1 auto]	1	57	off/auto	--	auto
	Building jump truck load valve [truck valve open/closed]	1	57	open/ closed	--	closed
	Building sump exhaust fan control [EF 28-1 manual][EF 28-1 off][EF 28-1 auto]	1	57	manual/ off/auto	--	auto
29	Time delay to acknowledge safety showed use	1	57	1 - 300	sec	60

TABLE 6-9

INDEX TO STANDARD OPERATING PROCEDURES

TABLE 6-9

INDEX TO STANDARD OPERATING PROCEDURES

TABLE 6-10

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
PRESTART AND SAFETY CHECK

CAUTION: System contains automatic equipment. Do not attempt any repair unless power is off, locked, and tagged out. Enter well vaults only in strict conformance with confined space health and safety procedures.

REFERENCE: Drawings K-2, M-6, and M-7 from Plans for Construction

NOTE: The groundwater extraction system controls and pumps operate automatically. The automatic controls and pumps should only be adjusted by trained and authorized personnel.

Step	Procedure	Information and Details
1	Disable intruder alarm for wells at MCP	Record date and time
2	Complete prestart and safety check for air stripper	Refer to Table 6-21
3	Complete prestart and safety check for conveyance system	Refer to Table 6-15
4	Check equipment and turn on power	Verify that there is no standing water in vault. Do not energize power if ponded water is observed. Remove ponded water with portable air diaphragm pump before entering. Turn on power at WWP meter box. At panel RP-EW energize: a. Programmable logic controller (YIC) UPS b. Telemetry transmitter/receiver (RFM) c. Flow indicating transmitter (FIT) At VFD turn main switch to on: a. Verify VFD setup (refer to Toshiba manual) b. Verify that there are no faults c. Verify cooling fan operating d. Verify air filters are clean

TABLE 6-10

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
PRESTART AND SAFETY CHECK

Step	Procedure	Information and Details
5	Verify PCP is energized	a. Amber power indication light illuminated b. No faults (red lights on PCP panel off; if faults record then press reset button c. Open PCP and verify no fault on YIC d. Verify radio power supply is on e. Verify panel fan is operating f. Verify panel fan air filters are clean g. Verify RFM setup code and transmit/receive lights h. Close and latch PCP door
6	Verify valve position	Refer to Table 6-2
7	Check level indicating transmitter	Measure depth to water with manual instrument, record value. Verify calibration of LIT, record differential error; if greater than ±5%, recalibrate probe
8	Check pressure indicating transmitter	Pressure should be greater than zero; if no pressure close groundwater discharge isolation valve from vault. Place VFD in panel mode, increase speed of pump very gradually to pressurize system. (Make sure air tower fan is running if this procedure is done.) Verify PIT operation. If not functioning, complete PIT calibration and validation. Open groundwater discharge isolation valve.
9	Check flow indicating transmitter	Verify setup options; verify that meters read zero. Record total accumulated flow for both direction of flow. If backflow is greater than 10 gallons from prior record, check valve may require cleaning or PSV valve may need adjusting.
10	Check pressure at PIT	If pressure is greater than 2 psi, system is ready. If pressure is 2 psi or less, air must be purged from the conveyance pipeline before starting. Start fan at treatment plant, operate pump VFD in panel control mode at VFD; do not operate pump greater than 50 Hz. Operate pump until discharge pressure is at least 15 psi, stop VFD, place VFD in remote control mode (refer to Toshiba operational manual for details).
11	Secure well vault	Close and lock vault entry doors and main breaker electrical box. Activate intruder alarm at MCP. Verify communication system normal.

TABLE 6-11

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
STARTUP PROCEDURE

CAUTION: Do not start more than one groundwater extraction well pump on any respective conveyance pipeline without allowing flow rate to stabilize. Failure to follow the startup procedure will cause extreme water hammer conditions that can severely damage treatment plant and conveyance piping.

Step	Procedure	Information and Details
1	Complete prestart and safety checks for groundwater extraction system	Refer to Table 6-10
2	Verify mode of operation selected for each extraction well flow or level mode	Refer to appropriate extraction well graphics screen at OIT for verification (if mode is incorrect, select on switch at appropriate well PCP to change to desired mode)
3	Verify that appropriate well is normal and scale control and air stripper system is on and normal	Refer to MCP system overview (screen 3) at OIT
4	Set/verify level 2 extraction well control parameters (skip this set if level 2 password is not known; proceed to step 5)	Refer to MCP well settings (screen 5) at OIT. Select appropriate well. Compare values with default setting listed in Table 6-8. Unless operating requirements necessitate, change default values. Record all settings
5	Set/verify level 1 extraction well control parameters	Refer to MCP well settings (screen 38) at OIT. Select well. If flow mode, verify well flow set point. If level mode, verify level set point. Check intruder alarm delay. Refer to Table 6-8 for default settings.
6	Start groundwater extraction pumping	Set OIT 2 to influent graphics (screen 24). From OIT 1 select a well graphics screen go to "wells level 1 settings," OIT screen 38, enter level 1 password; go to "wells controls" OIT screen 39, press "start" button

TABLE 6-11

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
STARTUP PROCEDURE

Step	Procedure	Information and Details
7	Monitor extraction well operations functions, compare respective	Set OIT #1 to appropriate extraction well graphics screen. Observe discharge pressure, water level drawdown, and flow rate. Verify that discharge flow rate at the well is being consistently received at the plant as observed from OIT screen 24. The sum of the well flows on each trunk line should be consistently (2 minutes) within 95 percent of the respective trunk line flow rate measured at the treatment plant.
8	Verify air stripper from control is responding to increased groundwater flow and air flow rate is adequate	Calculate required air flow rate using the equation: $Q_{air} = q_{water} \times R \times 0.134$ where: q_{air} = required air flow rate, cfm q_{water} = groundwater flow rate to air stripper, gpm (FT 20-4) [OIT screen 24] R - air to water ratio (gpm/cfm) [OIT screen 32] 0.134 = conversion factor gpm to cfm Do not start additional groundwater extraction well pumping until air flow rate to air stripper, as observed from OIT screen 31 air stripper system graphics, is greater than 95 percent of calculated air flow requirements.
9	Start additional extraction wells	Complete steps 4 through 7 above for each respective well.

TABLE 6-12

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
ROUTINE OPERATION

CAUTION: Failure to disable intruder alarm at MCP prior to entry for each respective well will cause well to automatically shutdown and initiate an alarm condition and alarm record at the treatment plant.

Well vault is a confined space. Use confined space entry procedures. Do not enter well vault alone. Presence of another qualified person with appropriate equipment is required.

Step	Procedure	Information and Details
1	Well vault security	Maintain intruder alarm system in the armed condition (OIT screen 52). Except when operation and maintenance activities require access to well vault.
2	Monthly (unless severe weather conditions) inspect condition at each well vault	a. Disable intruder alarm for each well prior to inspection to avoid well shutdown and alarm condition. b. Inspect air and vacuum relief valve. If leaking, isolate and clean valve in accordance with manufacturers installation (O&M manual equipment volume J). c. Check groundwater extraction rate and total accumulated flow on flow meter at each well; record data on inspection form. d. Check pump discharge pressure transmitter record reading. e. Check pressure relief valve to ensure that flow is not being released down well casing. Valve should have a set point of 60 psi (begins to open at 60 psi). f. Check vault sump for accumulation of groundwater. If water in sump, determine source and take immediate corrective action. g. Ensure all electrical, instrument, and control panels are properly closed and secure. h. Lock well vault covers and arm intruder alarm system when complete.

TABLE 6-12

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
ROUTINE OPERATION

Step	Procedure	Information and Details
3	Monthly	a. Perform all biweekly procedures. b. Check calibration of water level indicators using manual probe; record all data. c. Visually observe conditions of each radio telemetry antenna. Use binoculars to perform inspection from ground level. d. Clean or replace air filters on VFD and PCP panels. e. Check operating and exercise UPS power supply at well.

TABLE 6-13

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
ABNORMAL OPERATION

Step	Procedure	Information and Details
1	Power failure at treatment facility	All wells should automatically shut down; check alarm printer, or view alarm summary log on PC.
2	Communication failure	Communication failure can occur due to interference from atmospheric and weather conditions, and equipment failure. a. Reset communications at MCP. Verify that communication link is made before attempting to start well (normally 2 minutes is adequate time to wait; depends on setting of timer for poling frequency). b. Check radio modem at well site for proper operation and sensitivity settings; reset and retry. c. Check all radio and power box connections in PCP. d. Check radio antenna at well site for damage. Repair damage and retry. e. Replace radio modem with spare model. Configure replacement modem for specific well site and communication protocol (see O&M manual, equipment volume VI). If successful, send failed radio modem for repair. If not, check software file in YIC (maybe download a copy, file could be corrupted).
3	Low water level alarm	This alarm should only occur when the extraction well is operated in the flow mode and may be an indication of reduction in specific capacity of the well (scale encrustation of well screen, fouling of well or formation), regional subsidence in ground water levels, or failure of the automated level monitoring system. a. Verify low water level alarm set point (OIT screen 5). b. Check linearity and calibration of water level with manual level monitoring instrument before and after starting groundwater extraction pump. c. Reduce groundwater flow rate or operate in level mode. d. Verify PID control parameters gave and reset on pump settings screen (OIT screen 5).

TABLE 6-13

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
ABNORMAL OPERATION

Step	Procedure	Information and Details
4	Low pressure alarm	a. Check settings at MCP. b. Check well vault piping for failure. c. Check setting on pressure relief valve. d. Check air/vacuum relief valves. e. Check conveyance piping and appurtenances. f. Check air relief valves.
5	High pressure alarm	a. Check settings at MCP. b. Inspect well vault. c. Reset alarm at PCP. d. Check isolation valve exiting vault to ensure open. e. Verify that all conveyance pipeline valves are open. f. Check calibration of pressure transmitter with test gauge. g. Check water level in air stripper sump and flow control valve (FCV 20-1) at treatment facility. h. Review WinTrend database. i. Verify that treated water discharge valve is open.
6	Sump level high	a. Check well vault for water and leaks in piping. b. Reset alarm at PCP by pressing reset button. c. Start well in manual mode at well to observe source of leak. d. Do not start well in automatic mode until system is verified to be tight (nonleaky). e. Check sump drain, clean if necessary with water vacuum to remove accumulated silt.
7	Intruders	a. Inspect well for unauthorized access. b. Disable intruder alarm at treatment facility and reset alarm at PCP by pressing reset button. c. Inspect intruder alarm limit switch on vault hatch cover. d. Test limit switch if system fails to reset.

TABLE 6-13

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
ABNORMAL OPERATION

Step	Procedure	Information and Details
8	VFD at speed failure/VFD failure	a. Inspect VFD at well. b. Verify that power supply is on. c. Check error code on VFD panel. d. Check/clean air filter. e. Verify VFD cabinet A/C unit is actually operating and cooling cabinet. f. Verify that recirculating fans in VFD cabinet are working. g. Operate VFD in panel mode. h. Check/Verify VFD setup parameters. i. Refer to VFD O&M manual.
9	No groundwater flow measured by extraction well flow meter	a. Check that power is on to flow meter. b. Check readout on flow meter. c. Verify well communications and software perfomance at YIC. d. Verify that local water level in well is above top of pump (use manual water level indicator). e. Operate well in local manual (control panel) mode through VFD to verify operation of flow meter. f. Observe pressure and flow if neither pressure or flow change are observed then pump screen or pump could be fouled or riser pipe is disconnected. If pressure and flow respond to manual operation of pump, reset pump to operate in auto mode and check PID setup parameters for respective mode of well operation (flow or level).
10	Flow error	See abnormal operations for groundwater conveyance system.

TABLE 6-14

STANDARD OPERATING PROCEDURE
GROUNDWATER EXTRACTION SYSTEM
SHUTDOWN PROCEDURE

WARNING: Do not shut down groundwater extraction wells simultaneously. Allow sufficient time between successive well shutdown on the same trunk line so that pump discharge pressures and flow rates at the wells and plant are consistent.

Step	Procedure	Information and Details
1	Shutdown groundwater extraction pump	a. Record well discharge flow rate prior to shutting down. b. Record flow rate at respective flow meter at treatment plant. c. Subtract flow rate (a) from (b) and record. d. Enter well controls screen at OIT (screen 39). Locate specific well and press stop button. e. Monitor flow rate on respective trunk line flow meter. f. When flow rate from (e) is consistently approximately within 5 percent (1 minute) of expected rate (c), then proceed with shut down of additional wells on the same trunk line, as necessary. If only one well is operating on the system, it is advisable to lower the flow rate set point to prevent triggering of the low discharge pressure alarm. EMERGENCY: In an emergency situation it is permissible to stop wells simultaneously. However, this practice is very stressful to the piping installation and should be avoided when feasible. Low pressure alarms are likely to be triggered at some or all of the wells if the routine procedure is not followed.
2	Prolonged shut down of wells	a. Close the well installation gate valve (located in the respective well vault) if it is necessary to shut down the well or more than 2 days. b. Open drain valve HV X-1 to drain retained water that might freeze during winter causing instrument, piping, and valve damage. Close HV X-1 after draining is complete. Record flow meter readings, date, time, and reasons for shut down.

TABLE 6-15

STANDARD OPERATING PROCEDURE
GROUNDWATER CONVEYANCE SYSTEM
PRESTART AND SAFETY CHECK

CAUTION: The groundwater extraction and conveyance system contains automatic pumping equipment. Do not shut valves or attempt any repair unless power to affected pumps is off, locked, and tagged out, and appropriate system isolation valves are closed.

REFERENCE: Drawings K-1, and C-1 through C-16 from the Plans for Construction

Step	Procedure	Information and Details
1	Check facilities	Manholes and test connects (including stop and waste drain valves). Report any inconsistencies to responsible personnel.
2	Pressure test pipeline (as necessary)	Refer to Table 6-18 for pressure testing procedures.
3	Check conveyance system isolation valves	System contains both direct burial valves operable by T-bar and handwheel operated valves in manholes. Open all line valves. Verify that all test connection valves and stop and waste drain valves are closed.
4	Check system air/vacuum valves	Inspect valves for proper operation, that isolation valves are open.
5	Check other systems	Check that groundwater extraction system, air stripping treatment system, scale control chemical injection system are ready for service.

TABLE 6-16

STANDARD OPERATING PROCEDURE
GROUNDWATER CONVEYANCE SYSTEM
STARTUP PROCEDURE

Step	Procedure	Information and Details
1	Fill pipeline with water	a. Fill pipeline with potable water through test connection or by operating a single groundwater extraction pump in manual mode. A minimum of three operations personnel are required for this procedure: two at extraction well, one at MCP monitoring. Fill pipeline slowly to avoid potential drainage to piping system components and pump cavitation. Verify air release values are functioning properly.
2	Set flow error limits	a. Input allowable difference (as percentage) between the sum of measured flows and conveyed by the extraction wells with the measured flow at the treatment facility for each respective trunk line. An initial set point for flow error at 3 percent is reasonable. $Flow\ error = \frac{\lvert \sum Q_i - Q_T \rvert}{\sum Q_i}$ $\sum Q_i$ = the sum of the individual flow rates of all the groundwater extraction wells on a respective trunk line, gpm. Q = flow rate as measured at the treatment facility by the respective trunk line flow meter.

TABLE 6-17

STANDARD OPERATING PROCEDURE
GROUNDWATER CONVEYANCE SYSTEM
ROUTINE OPERATION

Step	Procedure	Information and Details	
1	Inspect facilities	Monthly:	inspect and test connections and manholes for leaking piping. Record.
2	Track conveyance system leakage (flow error)	Weekly:	Utilize data in WinTrend database for tracking flow error. Exclude days where system shut down occurs. Follow the procedures outlined below. Select starting date and enter WinTrend database file ACxxxxxx.dbf (xxxxxx = year, month, day). Select the first totalized flow record for the day commencing with column "L." Close the file. Add column "L" through "O" and record value. Add column "P" through "R" plus "T" and "U" and record value in column "S." Close file. Open file AFxxxxxx.dbf for the same day, select column "B" and multiply by 1000, then add column "G" divided by 10. The resultant value is in thousands of gallons (Kgal). Record this value. Subtract values calculated from "AF" files from values calculated from "AC" files, then divide the resultant by the "AC" value; multiply by 100 and the resultant is the flow error in percent. This process of calculating flow errors for each of the trunk line has been automated and is incorporated as a Microsoft Excel V5 macro named "flower.xls."
		Semi annually:	Exercise isolation valves on test connection, main conveyance pipeline, and appurtenance.

TABLE 6-18

STANDARD OPERATING PROCEDURE
GROUNDWATER CONVEYANCE SYSTEM
PRESSURE TESTING PROCEDURE

Step	Procedure	Information and Details
1	Shut down affected systems	Groundwater extraction wells that feed the segment of pipeline to be tested must be shut down. Nonaffected segments of the groundwater extraction system and groundwater conveyance system, as well as all systems at the treatment facility building, can remain in operation.
2	Isolate segment of pipeline	Use pipeline isolation valves in manholes and at buried shutoff accessible using T-bar to isolate the segment of pipeline to be tested (maximum test length is approximately 1,500 ft). Note: Pressure test will be greatly facilitated by testing pipeline before allowing it to drain or allowing air to enter line.
3	Pressurize pipeline segment	Connect small positive displacement-type pump fitted with pressure gauge and isolation valve to pipeline test connection and discharge pressure relief valve (see Drawings C-1 through C-15 in the Plans for Construction). Provide water supply to pump in bucket. Mark water level and cover bucket with plastic to prevent loss of water by evaporation. Pressurize pipeline to 150 psig (Phase II pipeline can be pressurized to 200 psig) by adjusting pressure relief valve to desired pressure. Let pump run continuously. Recover water by hose or piping from relief valve in bucket.
4	Conduct pressure test	Monitor pipeline pressure each hour for 6 hours. Monitor water level in bucket. If necessary, add measured volume of additional water to bucket. At end of test, verify system is at test pressure and determine quantity of water added over entire 6-hour test.

TABLE 6-18

STANDARD OPERATING PROCEDURE
GROUNDWATER CONVEYANCE SYSTEM
PRESSURE TESTING PROCEDURE

Step	Procedure	Information and Details
5	Calculate acceptable leakage rate	$L = \frac{N \times D \times P^{1/2}}{1{,}850}$ Where: L = allowable leakage rate (gallons/hour) N = number of pipe joints (assume every 20 ft) D = nominal pipe diameter (inches) P = test pressure (psig) For example: Assume 1,000 ft of 8-inch diameter pipeline is tested at 150 psig. Assuming a joint every 20 ft yields 50 joints (1,000/20). The allowable leakage rate is: $L = \frac{50 \times 8 \times 150^{1/2}}{1{,}850} = 2.65$ *gallons per hour*
6	Determine pass/fail	If measured leakage rate as determined by water in bucket as applied through pump is less than allowable leakage rate, pressure test passes. Otherwise, test fails.
7	Corrective action for failed test	Verify isolation valves are fully closed and sealed (listen to valve when one side of pipeline is pressurized). Look and listen for leaks at air release valves, block isolation valves, or at test connections. Isolate these components if possible. Repair or replace. Repeat test once to verify leakage rate. If test still fails, notify project manager. DO NOT operate affected groundwater conveyance pipeline and associated extraction pump until problem is corrected.
8	Drain test connection piping	Open stop and waste valve to protect test connection piping from freezing.

TABLE 6-19

STANDARD OPERATING PROCEDURE
GROUNDWATER CONVEYANCE SYSTEM
ABNORMAL OPERATION

Step	Procedure	Information and Details
1	Flow error at MCP	a. Verify that power is on to flow meters at treatment facility. b. Verify communications system between wells and treatment facility. c. Verify that isolation valves are closed at extraction wells that are shut down. d. Check accumulated backflow at extraction wells; check valves may be leaking. e. Check pressure relief valve at wellhead for proper pressure relief setting and proper seating (shut off at normal operating pressures). f. Check air and vacuum relief valves at wellhead and in manholes along pipeline alignment for proper seating; clean or replace leaky air/vacuum valves. g. Field verify pipeline integrity.
2	Reduced flow rates or elevated pressures	a. Verify system shutoff valves are fully open. b. Verify air/vacuum release valves are operative at wells and manholes. c. Pressure test pipeline. Refer to Table 6-18 for pressure testing procedures. d. Check instrumentation and ICM System for malfunction.
3	Elevated flow rates or reduced pressures	a. Check piping in well vaults and manholes for leaks. b. Verify air/vacuum release valves are operative. c. Pressure test pipeline. Refer to Table 6-18 for pressure testing procedures. d. Check instrumentation and ICM System for malfunction.
4	Unequal flow rates at wellheads and treatment facility	a. Check piping in manholes and well vaults for leaks. b. Pressure test pipeline. Refer to Table 6-18 for pressure testing procedures. c. Check instrumentation and ICM System for malfunction.

TABLE 6-19

STANDARD OPERATING PROCEDURE
GROUNDWATER CONVEYANCE SYSTEM
ABNORMAL OPERATION

Step	Procedure	Information and Details
5	Water in manholes	a. Check piping in manholes for leaks. If excessive, shut down pumps to affected section of line and close flow control valves to isolate section until corrective action is completed. If minor, increase inspection frequency and correct at next scheduled maintenance period.

TABLE 6-20

STANDARD OPERATING PROCEDURE
GROUNDWATER CONVEYANCE SYSTEM
SHUTDOWN PROCEDURE

Step	Procedure	Information and Details
1	Brief shutdown	None
2	Prolonged shutdown or preparation for system repair that requires opening pipeline	a. Drain wellhead piping (close well vault isolation valve HV X-3, if necessary. Open drain valve HV X-1. Close HV X-1 when line has finished draining. b. Isolate appropriate trunk line at treatment facility by closing HV 20-1, HV 20-2, HV 20-3, HV 21-1, HV 21-2, and HV 23-3. IMPORTANT: Continuously visually monitor pipeline draining process at each well to ensure well vault does not flood. Clean well vault drainage sump before commencing drainage.

TABLE 6-21

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
PRESTART AND SAFETY CHECK

CAUTION: System contains automatic equipment. Do not attempt any repair unless power is off, locked, and tagged out.

REFERENCE: Drawings K-2, K-3, K-4, M-1 through M-4 and M-11 from the Plans for Construction

NOTE: The system controls operate automatically. The automatic controls should only be adjusted by a representative of the manufacturer.

Step	Procedure	Information and Details
1	Check facilities	Treatment facility control room and process area, air stripping tower and containment area, fan room, sumps, louvered inlets, fan ducting, etc. Report any inconsistencies to responsible personnel.
2	Inspect and lubricate fan	Check fan belt for wear. Check fan belt tension; adjust as necessary. Check fan impeller for corrosion and pits. Lubricate fan motor, drive shaft, and bearings. Refer to Section 10.6.
3	Clean fan inlet filter	Remove filters from housing, wash with water, drain, dry, and reinstall. Replace damaged filter elements.
4	Check equipment and turn on power	Fan, fan VFD drive, building exhaust fans, valves, piping, heat tracing (in season), sump pumps (verify sump floats operating), influent flow meters, scale control chemical tank level probe, air stripper sump level probe, MCP.
5	Verify valve settings	See Table 6-3.
6	Verify readiness of other systems	Groundwater extraction system, groundwater conveyance system, scale control chemical injection system.
7	Calibrate pH probes	Record calibration data in facility log.
8	Verify air stripper influent pipeline drain valve system	Valves are closed and in automatic mode.
9	Initiate report generating computer software	Load WinLinks, WinTrend, and Runview, start logging under WinTrend.

TABLE 6-22

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
STARTUP PROCEDURE

Step	Procedure	Information and Details
1	Set air to water ratio	Typically this value shall be set at 100 unless testing proves that a lower value will provide adequate treatment. Air to water ratio set point is located on OIT screen 32, which requires the level 2 password.
2	Verify sump pump systems are ready for operation	Sump pump systems are set in automatic mode and are operational. See sump pump systems procedures (Table 6-3 through 6-8).
3	Verify position of influent flow control valve FCV 20-1	Position of valve may be observed from OIT screen 24; valve should be open 100 percent.
4	Verify scale control chemical injection system is ready	Complete startup procedure for scale control chemical system (Table 6-28).
5	Settings for air stripper system are appropriate	Verify settings on OIT screen 48 "air stripper settings" (refer to Table 6-8 for assistance in selecting default values)
6	Complete startup procedure at OIT screen 48	a. Press stop button. b. Press disable button. c. Press VFD reset button. d. Press enable button. e. Press start button. f. Observe that fan is operating from OIT screen 31, Air Stripper System
7	Verify the following:	Observe status of following at OIT screen 31, Air Stripping System: a. Fan is on. b. Fan vibration is normal. c. VFD is at speed. d. VFD output equals 50 percent. e. Air flow is greater than 10,000 cfm. f. Air stripper differential pressure normal. g. Inlet air filter differential pressure normal. h. Distribution tray level is normal. i. Water level in clear well is 0.0.

TABLE 6-22

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
STARTUP PROCEDURE

Step	Procedure	Information and Details
8	Start groundwater extraction systems as appropriate	Follow startup procedure for groundwater extraction system (Table 6-11).
9	Start scale control chemical system	Follow startup procedure for scale control chemical system (Table 6-29). Verify/set chemical feed rate after flow rate stabilizes.
10	Check instrument readings and operational status of systems	Verify that system is responding as expected; stop/correct system if alarm conditions occur or are threatened. Observe system frequently during first hour of operation. Verify that data logger is on.

TABLE 6-23

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
ROUTINE OPERATION

Step	Procedure	Information and Details
1	Inspect system	Each visit: piping, valves, fan, fan VFD, sumps, air stripping tower
2	Check system monitoring parameters	Each visit: Verify parameter values are stable and within acceptable limits: air flow, fan inlet differential pressure, duct pressure, stack pressure, clear well level, clear well temperature, etc.
3	Check scale buildup	Monthly: Look in clear manway on air stripping tower, remove and evaluate scale coupon.
4	Sample influent and effluent	See Section 8.0 for sampling locations and frequencies and sample analysis procedures.
5	Lubricate equipment	See Section 10.6.
6	Turn on/off heat cable system	Seasonally, as necessary depending upon exterior temperatures.
7	Briefly shut down system for inspection of concealed system elements.	Semiannual. Check fan blade, fan belt, inlet filter and louver, tower liquid distributor, mist eliminator. Clean and adjust as necessary.

TABLE 6-24

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
AIR STRIPPING TOWER BYPASS

NOTE: Directs groundwater to air stripping tower clear well instead of top of air stripping tower. No treatment of groundwater is effected. Bypassed groundwater drains to outfall. Bypass of groundwater with contaminant concentrations in excess of allowable discharge limits is not allowed.

Step	Procedure	Information and Details
1	Open bypass shutoff valves	HV 21-1, HV 21-2, HV 21-3
2	Open bypass flow control valve	LCV 21-1
3	Close influent line shutoff valves	HV 20-1, HV 20-2, HV 20-3
4	Other procedures	See Table 6-23 for routine operation

TABLE 6-25

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
POTABLE WATER FLUSHING OF AIR STRIPPING TOWER

NOTE: This procedure is for flushing air stripping tower with potable water after routine operation. This procedure is necessary prior to opening or entering tower for maintenance or repair activities. See Section 11.7.5 for air stripping tower entry procedures.

Step	Procedure	Information and Details
1	Shut down all systems	Groundwater extraction system, air stripping treatment system, scale control chemical injection system; or spent batch cleaning solution disposal system
2	Turn on power to pump P25-2	
3	Start seal flushing system for pump P25-2	Connect hose to flushing inlet connection and industrial water hose bib. Open valves HV 25-17, HV 25-18. Set PCV 25-1 to 10 psig. Open industrial water hose bib. Adjust valve HV 25-19 to obtain approximately 0.1 gpm flow. Monitor flow rate and pressure.
4	Close influent valves	HV 20-1, HV 20-2, HV 20-3
5	Close bypass valves	HV 21-1, HV 21-2, HV 21-3
6	Close discharge isolation valve	HV 25-1
7	Open potable water isolation valve	HV 29-3
8	Start pump P25-2	
9	Monitor water flow rate, total water added, line pressure, clear well level	Flush approximately 15 minutes
10	Stop pump P25-2	Turn off power, turn off seal flushing water.
11	Close valves	HV 29-3

TABLE 6-26

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
ABNORMAL OPERATION

Step	Procedure	Information and Details
1	Power failure at treatment facility	Automated telephone dialing alarm system (ADAS) will provide notification. Main control panel (MCP) and report generating computer will function for approximately 15 minutes on battery backup (depends on load). Operator interface will not function. Groundwater extraction system will automatically shut down since discharge limits will not be achieved without air flow from fan.
2	Power failure at one or more wells	See Table 6-13 for groundwater extraction system.
3	Fan failure	Shut down all systems. Check fan VFD, attempt to reset if tripped. Check recent air flow rate data and vibration switch data. If within acceptable limits, attempt to restart fan. Visually observe fan operation for vibration noise. If reset is unsuccessful or fan continues to fail, shutdown fan and turn off power at main electrical panel. Consult manufacturer.
4	Insufficient air flow rate and/or excessive pressure drop through inlet filter and/or tower	Shut down all systems. Check fan belt and bearings. Check fan inlet louvers for proper setting, adjust if necessary. Check fan inlet filter, clean if necessary. Check fan inlet ducting and duct expansion joints for defects, correct as necessary. Check scale coupon, perform batch cleaning if necessary. Check mist eliminator, pressure wash if fouled. Check instruments and ICM system for malfunction. In cold weather check for icing in tower (packing material, mist eliminator, etc.) and icing of filters/louvers).
5	Elevated air flow rate or abnormally low pressure drop at inlet and/or tower	Check VFD drive for proper operation. Check fan inlet filter and inlet ducting for holes. Check outlet ducting and duct expansion joints for defects, correct as necessary. Check nozzles and blind flanges for loose or leaking connections, correct as necessary. Check instruments and ICM system for malfunction.
6	Water in process area or containment area	Check piping for leaks. Check recent pressure data for line overpressures. If leakage is excessive, shut down all systems until corrective action is completed. If minor, increase inspection frequency and correct at next scheduled maintenance period. Correct all leaks prior to batch cleaning.

TABLE 6-26

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
ABNORMAL OPERATION

Step	Procedure	Information and Details
7	Effluent limits not achieved	a. VOCs: insufficient air flow to remove VOCs. Check setting for air to water ratio. Increase if necessary. Check fan operation, instruments, and ICM system. Check tower for scale or fouling. b. Other constituents: air stripping tower does not remove or alter non-VOC constituents. Sample individual wells to determine the well(s) contributing to the exceedance, and reduce the pump rate(s) of the well(s).
8	Water leaking from fan or duct expansion joints	Air stripping tower operated without running fan; always run fan when pumping water through air stripping tower (even when not required for VOC removal; for example, during potable water flushing).
9	No flow through pH and/or other effluent monitoring instrument piping	Verify shutoff valves to instrument piping are open. Close valve HV 24-3 slightly to achieve full flow in effluent pipe. Clean flow through piping for pH meters. Caution: Closing valve HV 24-3 too much will restrict drainage from air stripping tower clear well causing system shutdown due to high water level in clear well.
10	Water level in air stripping tower clear well too high (>2½ ft)	a. Open effluent valve HV 24-3 (verify monitoring instrument piping to pH and other sensors still have flow). b. Check effluent piping to outfall for damage and/or proper operation of air/vacuum release valves. Check outfall and outfall sediment tank for damage. c. Check air stripping tower clear well, drain, and valve HV 24-3 for sludge/debris.
11	Water level in air stripping tower clear well to high (>2½ ft) and/or fluctuating excessively	Check motorized flow control valve FCV 20-1 for proper operation.

TABLE 6-27

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
SHUTDOWN PROCEDURE

Step	Procedure	Information and Details
1	Prior to shutdown (for an extended shutdown period only)	Use all scale control chemical if possible. Pump all water out of the building sump, batch cleaning containment area sump, and air stripper sump to the air stripper for treatment.
2	Shutdown secondary systems	Scale control chemical injection system, spent batch cleaning solution disposal system
3	Shutdown groundwater extraction pumps	See Table 6-14.
4	Turn off power	Turn off power to fan and other equipment if it will not be used for an extended period of time.
5	Prepare system for extended shutdown, if necessary	Arrange for offsite disposal of spent batch cleaning solution, if necessary. Shut down all secondary systems other than those noted in step 6. Dispose of all drummed chemicals at offsite facility. Drain and/or flush with potable water, as appropriate, all secondary systems (piping, pumps, valves, etc.). Pump building sump and batch cleaning containment area sump to storage container if not down previously by manually operating sump pumps (use air operated pump if necessary for final pump out). Shut down all systems. Close valves HV 20-1, HV 20-2, HV 20-3, HV 21-1, HV 21-2, and HV 21-3. Drain influent line and bypass line by opening valves FV 23-1 and FV 23-2. Building sump must then be pumped out into large container to hold until tower is operational again or disposed of property. Clean and lubricate all equipment. Clean fan inlet filters and louvers. Shut off potable water system at HV 29-1, HV 29-3, and unnumbered shutoff at lavatory sink, shower, toilet, laboratory sink, and sample sink. Shut off water to eye washes and emergency showers and drain exterior portions of lines. Shut off water to industrial water line to air stripping tower upper platform; drain exterior portion of line. If extended shutdown during rainy/snowy weather then sump heaters need to be removed if pumps are not operational so heater terminals will not be submerged.

TABLE 6-27

STANDARD OPERATING PROCEDURE
AIR STRIPPING TREATMENT SYSTEM
SHUTDOWN PROCEDURE

Step	Procedure	Information and Details
6	Equipment to remain operative during extended shutdown	HVAC system, heating system: adjust to low setting Building process area exhaust fan system Electric sump heaters (in season) Piping heat tracing (as necessary for undrained lines) Instrumentation and control system (security/fire protection systems only)

TABLE 6-28

STANDARD OPERATING PROCEDURE
SCALE CONTROL CHEMICAL INJECTION SYSTEM
PRESTART AND SAFETY CHECK

CAUTION: Scale control chemical is used to inhibit the deposition of calcium carbonate scale. Review the material safety data sheet for this chemical (see Appendix C) and review the safety procedures in Section 11.0 prior to operating this system.

REFERENCE: Drawings K-3, K-4, M-1 through M-5, and M-9 of the Construction As-Built Drawings

Step	Procedure	Information and Details
1	Inspect facilities	Tank T-1, pumps P22-1 and P22-2, piping, valves, containment structures, sumps, spill response materials
2	Obtain scale control chemical	Polyacrylate scale inhibitor: Allied Colloid DP26 2696 (diluted 1:1 with water), Nalco Chemical Company No. 8357 or equivalent. Store in tank T-1. See Appendix D for material safety data sheets.
3	Verify valve settings	See Table 6-4.
4	Fill tank T-1 with scale control chemical	Close valve HV 22-1. If filling tank from truck, attach hose from tuck unload at valve HV 22-10. Open valve HV 22-10 and verify HV 22-9 is closed. If filling tank from drums, place hose into drum, open valve HV 22-9 and verify valve HV 22-10 is closed. Open valve HV 22-11. Turn on power to pump P22-3. Start pump. Verify positive flow to tank. Monitor fill process as there is no automated overfill protection. Change drums, as necessary, if applicable. If using Allied Colloid or other scale inhibitor that requires dilution with water, attach hosing to pump (P22-3) and drop into tank. Run the pump (approximately 15-20 minutes to mix 1:1 chemical/water ratio). If water was not used for dilution then pump 20 gallons of potable water through system and into tank. Close valves HV 22-9, HV 22-10, and HV 22-11.
5	Verify valve settings	See Table 6-4.

TABLE 6-28

STANDARD OPERATING PROCEDURE
SCALE CONTROL CHEMICAL INJECTION SYSTEM
PRESTART AND SAFETY CHECK

Step	Procedure	Information and Details
6.	Determine scale control chemical input rate	Calculate input rate by: $$Q_{sc} = \frac{Q_l \left(\frac{60\ min}{hr}\right)\left(\frac{3.78\,L}{gal}\right) D_{sc}}{\rho_{sc}\left(\frac{450{,}000\ mg}{lb}\right)}$$ where: Q_{sc} = scale control chemical input rate [gallons per hour (gph)] ρ_{sc} = density of scale control chemical (lb per gallon) Q_l = Flow rate of groundwater through air stripping tower (gpm) D_{sc} = Dosage of scale control chemical per volume water (mg/L)]

TABLE 6-28

STANDARD OPERATING PROCEDURE
SCALE CONTROL CHEMICAL INJECTION SYSTEM
PRESTART AND SAFETY CHECK

Step	Procedure	Information and Details
7	Calibrate feed pumps, P22-1, P22-1, if necessary	Note: Groundwater extraction system and air stripping treatment system must be operating when calibrating feed pumps. Close valves HV 22-5 and HV 22-6. Turn on power to pump P22-1. Run pump for 5 minutes to warm up or longer as necessary (up to 15 minutes) to prime system if it was previously drained. Adjust pump control to achieve desired flow rate for calibration test. Adjust controls to achieve approximately 80 psi backpressure on four-function discharge valve on pump. Stop pump. Fill calibration cylinder by briefly opening valve HV 22-2. Close valve HV 22-1. Start pump and record start time. Monitor drop of fluid level in calibration cylinder. Monitor line pressure at PI 22-1 (20-50 psig is typical). After sufficient time to obtain representative reading from calibration cylinder, stop pump and record stop time. Calculate flow rate by: Flow Rate (cc/sec) = (CalCyl1 - CalCyl2) / time where CalCyl1 and CalCyl2 are the initial and final calibration cylinder values in cubic centimeters (cc) and time is in seconds. Flow Rate (gal/hr) = 0.96 x (CalCyl1 - CalCyl2) / time Repeat for pump P22-1. If results are within 5 percent of initial results, calibration is complete; otherwise repeat third time. If erratic results are obtained, check for proper system configuration and consult manufacturer. Close valves HV 22-3 and HV 22-4. Open valves HV 22-5 and HV 22-6. Repeat calibration test using pump P22-2. Turn off power to pumps.
8	Verify valve settings	See Table 6-4.
9	Pressurize pulsation dampeners	Use compressed air to pressurize to 50 psi.

TABLE 6-29

STANDARD OPERATING PROCEDURE
SCALE CONTROL CHEMICAL INJECTION SYSTEM
STARTUP PROCEDURE

Step	Procedure	Information and Details
1	Start air stripping treatment system and groundwater extraction system	
2	Turn on power to pumps P22-1, P22-2	
3	Start one of the two pumps	Set to automatic operation mode.
4	Monitor flow and pressure	

TABLE 6-30

STANDARD OPERATING PROCEDURE
SCALE CONTROL CHEMICAL INJECTION SYSTEM
ROUTINE OPERATION

Step	Procedure	Information and Details
1	Inspect facilities	Daily or each site visit. Check pumps, piping, valves, and tanks for leaks or deterioration.
2	Check pump status	Daily, or each site visit. In event of pump failure, system controller automatically shuts down first pump and actives second pump. In event of second pump failure, system controller automatically shuts down all systems after preset time delay.
3	Check scale control chemical level, obtain additional as needed.	Weekly, check tank T-1. Consumption of scale control chemical is approximately one tank per 2 months at 1 gallon per hour injection, continuous use.
4	Alternate pump use	Every 2 weeks, shut off active pump and turn on inactive pump.
5	Check pump calibration	Quarterly. See Table 6-28 for calibration procedure.
6	Check piping and tank	Annually. Lines between scale tank and influent need to be cleaned. Tank may also require cleaning.

TABLE 6-31

STANDARD OPERATING PROCEDURE
SCALE CONTROL CHEMICAL INJECTION SYSTEM
ABNORMAL OPERATION

Step	Procedure	Information and Details
1	Reduced pump discharge pressure	Check valve PSV 22-1 or PSV 22-2 as applicable. If valve is stuck open, fluid may circulate back to pump inlet.
2	Elevated pump discharge pressure, reduced flow rate	Check influent line pressure. If pump discharge line pressure is substantially greater than influent line pressure, problem is in scale control chemical injection system piping. Check that valves between tank and influent line are set per Table 6-4. Adjust valve FCV 22-1. Check valve XV 22-1; swing arm may be stuck closed.
3	Pump failure	Check power at circuit breaker. Try other pump to confirm system is properly configured. Check head on failed pump, clean if necessary. If not successful, consult manufacturer.

TABLE 6-32

STANDARD OPERATING PROCEDURE
SCALE CONTROL CHEMICAL INJECTION SYSTEM
SHUTDOWN PROCEDURE

Step	Procedure	Information and Details
1	If for brief shutdown, stop pump	P22-1 or P22-2, as applicable.
2	If not operating for extended time period, secure system prior to shutdown of air stripping treatment system.	Place drum unload stinger connecting at valve HV 22-13 into 5 gallon bucket of water. Stop pump. Close valve HV 22-1. Open valve HV 22-13. Start pump and operate for 15 minutes. Stop pump and close pump isolation valves. Open isolation valves to second pump. Start second pump and operate for 5 minutes. Stop pump. Close valve HV 22-12. Open isolation valves to both pumps. Open valves HV 22-7 and HV 22-8 to drain system. Briefly open pressure relief valves PSV 22-1 and PSV 22-2 as necessary. Elevate and invert drum unload stinger to promote drainage. Close valves HV 22-7 and HV 22-8.

TABLE 6-33

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
PRESTART AND SAFETY CHECK

CAUTION: Batch cleaning requires the use of concentrated, hazardous chemicals including one or more of the following: hydrochloric acid, sodium hydroxide (caustic soda), and hydrogen peroxide. Review the material safety data sheets for these chemicals (see Appendix C) and review the safety procedures in Section 11.0 prior to performing batch cleaning.

REFERENCE: Drawings K-2 through K-4, M-1, M-2, and M-9 from the Construction As-Built Drawings

NOTE: This procedure description is for batch cleaning using hydrochloric acid. Cleaning using hydrogen peroxide or other chemicals is similar, except much less chemical solution is needed and therefore the chemicals will be input to the air stripping tower clear well from drums using system 26. See Section 5.5 for additional details.

Step	Procedure	Information and Details
1	Inspect facilities	Tanks, pumps, piping, valves, containment structures, sumps, spill response materials
2	Obtain batch cleaning chemicals	Hydrochloric acid (see Table 5-1). Arrange delivery in tanker truck just prior to batch cleaning. Transfer acid from tanker truck in small batches (maximum 500 gallons) and only transfer additional acid if and when the previous batch of acid has been completely spent by reaction with the scale. The tanker truck should remain at the facility during batch cleaning to ensure that adequate acid is available and to haul back unused acid.
3	Store chemicals properly	Allowable storage duration is limited. See Appendix A.
4	Check other systems	Air stripping treatment system.
5	Arrange for disposal of batch cleaning solutions	Spent hydrochloric acid solution or any other spent cleaning solutions must be disposed of offsite in accordance with applicable environmental regulations.

TABLE 6-33

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
PRESTART AND SAFETY CHECK

Step	Procedure	Information and Details
6	Clean pump P25-1 inlet strainer	Close valves HV 25-1 and HV 25-2 prior to opening strainer.
7	Verify valve settings for batch cleaning system startup	See Table 6-5.

TABLE 6-34

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
STARTUP PROCEDURE

Step	Procedure	Information and Details
1	Shut down all systems	
2	Close discharge valve	HV 24-3
3	Close pH monitoring loop isolation valves	HV 24-5, HV 24-6
4	Close influent and bypass isolation valves	HV 20-1, HV 20-2, HV 20-3 HV 21-1, HV 21-2, HV 21-3
5	Close influent and bypass flow control valves	FCV 20-1 LCV 21-1
6	Close isolation valves to other systems	FV 23-1, FV 23-2, HV 24-1, HV 26-1, HV 27-4
7	Add potable water to clear well	Fill clear well with 500 gallons of water (approx. 1.7 ft deep) by temporarily opening valve HV 29-3 from potable water system. Open valve HV 25-2. Close valve HV 29-3. Start pump P25-1 to recirculate water through clear well. Check thoroughly for leaks; if any are present - fix before proceeding. Stop pump. Close valve HV 25-4. Open valve HV 25-3. Start pump to recirculate water through tower. Check thoroughly for leaks; if any are present - fix before proceeding. Stop pump.

TABLE 6-34

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
STARTUP PROCEDURE

Step	Procedure	Information and Details
8	Unload a maximum of 500 gallons of hydrochloric acid from tanker truck into air stripping tower clear well	NOTE: Total quantity of cleaning solution and water must not exceed clear well capacity of 3,000 gallons (equivalent to a clear well depth of approximately 5 ft). Use truck unload at valve HV 25-8 in air stripping containment area. Close valve HV 25-3. Open valve HV 25-4. Put on protective clothing (see Section 11.5.2). Connect truck hose to truck unload at valve HV 25-8. Two procedures are available for unloading tanker truck (see below). Procedure 1: Use pump P25-1 to unload truck. Connect industrial water hose to pump flushing inlet connection and industrial water hose bib. Open valves HV 25-17, HV 25-18. Open industrial water hose bib. Set PCV 25-1 to 10 psig. Adjust valve HV 25-19 to obtain approximately 0.1 gpm flow. Monitor seal flushing water flow rate and pressure. Close valve HV 25-1. Open valve HV 25-7 and HV 25-8. Turn on power to pump P25-1. Start pump. Monitor flow rate, line pressure, and clear well level. Check continuously for leakage and terminate fill immediately if detected. When desired quantity of acid is transferred, stop pump. Close valve HV 25-8. Procedure 2: If tanker truck is fitted with pump, use truck load connection at valve HV 25-5. Close valve HV 25-4. Connect truck hose to facility piping. Open valve HV 25-5. Unload acid. Close valve HV 25-5. Alternatively, use truck load connection at valve HV 24-1. connect truck hose to facility piping. Open valve HV 24-1. Unload acid. Close valve HV 24-1.

TABLE 6-35

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
ROUTINE OPERATION

Step	Procedure	Information and Details
1	Verify valve settings for recirculation	See Table 6-5.
2	Verify valve settings for defoamer feed system	See Table 6-7.
3	Start defoamer feed system	Place stinger in drum of defoamer solution. Open valves HV 27-1 and HV 27-4. Start pump P27-1 and adjust to desired flow rate.
4	Recirculate batch cleaning solution	Use pump P 25-1 with seal flush. Set quantity or duration at MCP. Pump will stop automatically. Stop defoamer feed system when pump P25-1 stops.
5	Monitor system parameters	Clear well level and temperature, recirculation flow rate, line pressure, inlet strainer differential pressure, sump levels, pump seal flushing water flow rate and pressure, air stripping tower foam level in liquid distributor, etc.
6	Inspect facilities	Check continuously for leakage and terminate process immediately if detected. Check pump, piping, valves, air stripping tower and containment area, sumps, etc.
7	Prior to pump P 25-1 shutoff, monitor pH.	Open valves HV 24-5 and HV 24-6. Read pH values (allow 2 minutes for readings to stabilize). Check pH periodically until pump P 25-1 stops. Continue recirculation until pH is approximately 4.

TABLE 6-35

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
ROUTINE OPERATION

Step	Procedure	Information and Details
8	Neutralize solution, if necessary	Desired pH of final solution is 6 - 8. Achieving this pH by recirculating batch cleaning solution will take excessively long. Therefore, add sodium hydroxide to solution in clear well to achieve a pH of 6 - 8. NOTE: Add sodium hydroxide periodically in small quantities and allow to recirculate and mix thoroughly before adding more. Complete mixing of sodium hydroxide with clear well solution may take an hour or more. If excess sodium hydroxide is added and pH exceeds 8, add additional acid to neutralize solution. Lesser quantities of sodium hydroxide will cause greater changes to pH value as pH increases from 5 to 7. To add sodium hydroxide, use system 26. Close valve HV 25-3. Open valves HV 25-4 and HV 25-6. Start pump P25-1 in HAND mode. Open valve HV 26-1. Put Pump P26-1 in drum and start pump. Visually monitor liquid level in drum and shutoff pump when desire quantity has been input. Monitor closely; pump capacity is approximately 12 gallons per minute. Continue recirculating clear well solution for 1 hour (or as necessary based on experience) until pH readings stabilize. Add additional sodium hydroxide as needed to achieve desired pH. When pH has been properly adjusted, close valve HV 26-1.
9	Transfer neutralized batch cleaning solution in clear well to tank T-3	Use pump P25-1 in HAND mode with seal flush. Close valves HV 24-5, HV 24-6, and HV 25-6. Open valve HV 25-9. Start pump. Monitor tank liquid level to prevent overfilling. When clear well is mostly empty (approximately 1 ft remaining), stop pump. Close valve HV 25-9.

TABLE 6-35

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
ROUTINE OPERATION

Step	Procedure	Information and Details
10	Repeat startup procedure and routine operation procedures as necessary with additional inputs of water, acid, and sodium hydroxide.	Add 500 gallons of water to the clear well (less water is needed than previously due to solution remaining in clear well from first cleaning). Add acid (500 gallons maximum). After addition of last quantity of acid, flush truck unload line (see step 11). Recirculate solution while adding defoamer. Monitor pH. Adjust pH as necessary with sodium hydroxide. Transfer neutralized solution to tank T-3. NOTE: Prior to transfer of last quantity of solution to tank T-3, flush chemical feed system (see step 12).
11	Flush truck unload line	Note: Have industrial water hose available and ready for operation when handling or servicing acid containing equipment. Wear protective clothing. After acid is transferred and pump P 25-1 is stopped, close valve HV 25-8. Close valves HV 25-7, HV 25-8, and HV 29-3. Disconnect truck hose from truck and place end in air stripping tower containment area sump. Close valves HV 25-1 and HV 25-2. Open valve HV 29-3. Open valve HV 25-8 as necessary to rinse truck unload (collect acidic water in sump). Do not overfill sump. Disconnect hose and rinse hose and hose bib with industrial water. Return to step 10. NOTE: Sump pump P28-2 will automatically pump acidic water to air stripping tower.
12	Flush chemical feed system	Fill empty drum half full of water. Open valve HV 26-1. While operating pump P 25-1, put pump P 26-1 in drum and start pump. Pump drum almost dry. Stop pump. Close valve HV 26-1.

TABLE 6-36

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
ABNORMAL OPERATION

Step	Procedure	Information and Details
1	Elevate differential pressure at basket strainer on pump P25-1 inlet	Clean basket strainer. If concentrated acid in line, attempt to flush first with potable water. Close valves HV 25-1, HV 25-2 and HV 25-7 prior to opening strainer. Use extreme caution and wear protective clothing including respirator with acid gas cartridges. See Section 11.5.2.
2	Pump P27-1 failure	Check circuit breaker. Check operation in hand mode. Check head, clean if necessary. If not successful, consult manufacturer.
3	Pump P25-1 failure	Check circuit breaker. Check operation in hand mode. Check inlet basket strainer, clean if necessary (see symptom 1). If not successful, consult manufacturer.
4	Facility power failure	Turn off power to all equipment. Shut isolation valves as necessary, depending upon activity at time of power failure. When power is restored, restart computer control system and verify proper operation before proceeding. When verified, open isolation valves and restart system at appropriate step.

TABLE 6-37

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
SHUTDOWN PROCEDURE

Step	Procedure	Information and Details
1	Connect hose to pump clear well dry	Connect hose at valve HV 24-4. Fill hose with industrial water (pump P25-1 is not self priming). Connect hose at valve XV 26-1. Open valves HV 24-4, HV 26-1, and HV 25-9. Start pump P25-1. Stop pump immediately at first sign of lost of prime (approximately 1 ft depth in clear well). Close valve HV 26-1.
2	Add potable water to tower for final rinse.	Close valve HV 25-2. Open valve HV 29-3. Fill clear well with 1,000 gallons of water (approximately 1.7 ft deep). Close valve HV 29-3. Open valve HV 25-2.
3	Recirculate water through tower	Close valve HV 25-4. Open valve HV 25-3. Start pump P 25-1 and operate for 15 minutes. Stop pump.
4	Flush defoamer feed system	Place stinger into 5-gallon bucket of water. Start pump P 27-1 and operate for 15 minutes. Stop pump. Close valve HV 27-4. Open valves HV 27-2 and HV 27-3 to drain system. Briefly open pressure relief valve PSV 27-1 as necessary. Elevate and invert drum unload stinger to promote drainage. Close valves HV 27-1 and HV 27-2.
5	Recirculate water through clear well	Close valve HV 25-3. Open valve HV 25-4 and HV 25-6. Start pump P25-1 and operate for 5 minutes.
6	Transfer rinse water to tank T-3.	Use pump P 25-1 in hand mode with seal flush. Close valve HV 25-3 and HV 25-6. Open valve HV 25-9. Start pump. Monitor tank liquid level to prevent overfilling. Before prime is lost, close valve HV 25-1 and open valve HV 26-1. Start pump. Partially close valve HV 25-4 as necessary to reduce flow to delay loss of prime. Stop pump when prime is lost. Stop pump P25-1 seal flushing. Close valves HV 24-4 and HV 26-1. Open valve HV 25-4.
7	Flush pump P 25-1	Close valve HV 25-1. Open valve HV 29-3. Start pump for one minute. Monitor tank liquid level to prevent overfilling. Stop pump. Close valve HV 29-3.

TABLE 6-37

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
SHUTDOWN PROCEDURE

Step	Procedure	Information and Details
8	Turn off power to pump P25-1.	
9	Disconnect hose from HV 24-4 to XV 26-1	Drain and rinse hose to floor drain.
10	Verify closure of shutoff to potable water system	Close HV 29-3.
11	Open valves to drain piping for freeze protection.	HV 25-8.

TABLE 6-38

STANDARD OPERATING PROCEDURE
BATCH CLEANING SYSTEM
SPENT BATCH CLEANING SOLUTION DISPOSAL

Step	Procedure	Information and Details
1	Identify type of waste contained in tank T-3. Select appropriate waste hauler	The facility operator should identify if the spent batch cleaning solution is a dangerous or hazardous waste and coordinate with an appropriate waste hauler to provide for proper truck placarding, manifesting, transportation, and disposal of the waste. The proper procedure for classification and management of dangerous waste is contained in Appendix A.
2	Ensure protective clothing is worn	Facility operator(s) and solution disposal truck driver(s) should wear proper protective clothing. If spent solution is hydrochloric acid that has not been neutralized to pH > 4, protective clothing should include air-purifying respirators with acid gas cartridges.
3	Connect hose from waste hauling truck to tank T-3	Have the waste hauling vacuum truck connect to tank T-3 at the truck load connection, at HV-11, which is located on the north side of tank T-3.
4	Open tank valve	Open HV 25-11
5	Transfer waste solution	Open the appropriate valve(s) on waste hauling truck and vacuum out the spent batch cleaning solution.
6	Wash out residual waste	Industrial water may be used to attempt to rinse out all residual waste solution from the bottom of the tank. To do this, open valves HV 29-3, HV 25-2, HV 25-4, and HV 25-9. Turn on the batch cleaning solution recirculation pump, P 25-1 to pump water into the tank.
7	Stop rinse water	Stop pump P 25-1. Close valves HV 29-3, HV 25-4, and HV 25-9.
8	Remove rinse water	Continue to pump out tank T-3 to transfer out as much rinse water as possible to the waste hauling truck.
9	Close valve and disconnect hose	When tank T-3 has been emptied, close truck load valve HV 25-11. Disconnect the vacuum hose from the truck load connection. Ensure that waste solution remaining in the hose is not spilled and that all waste solution is transferred into the waste hauling truck.